APRIL
1958

FOUNDRY

A PENTON PUBLICATION

SHELL MOLDING . .

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Page 80

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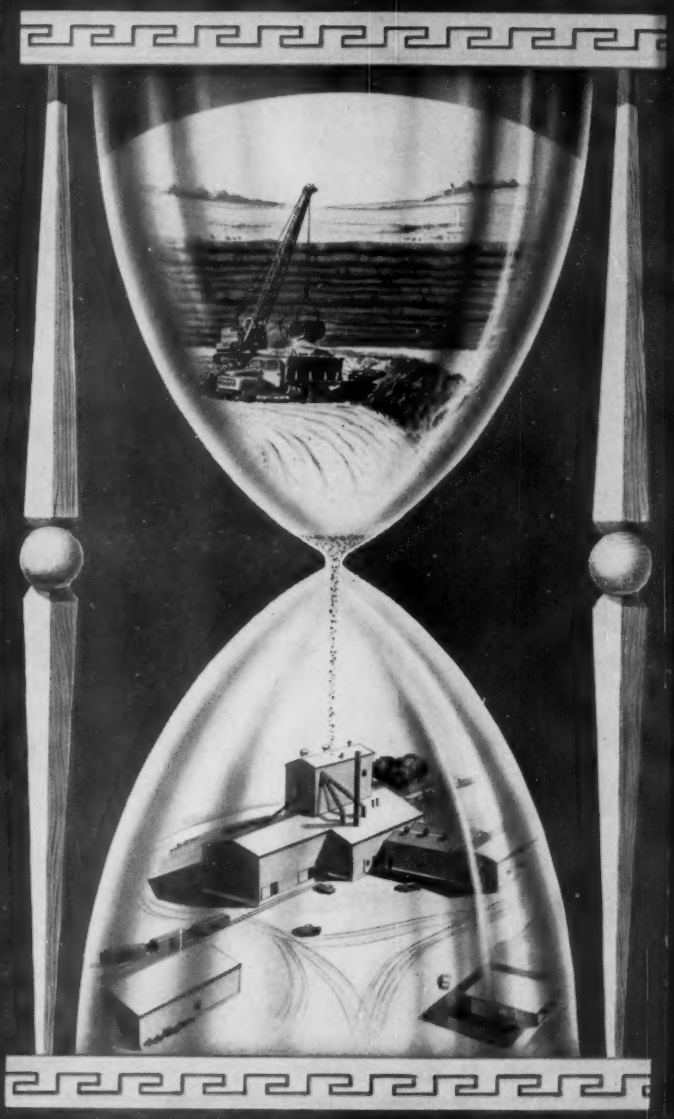
TIME WILL TELL...

SUPPLY . . .

should have an important bearing on any foundry's decision to standardize with one bentonite brand. Any abrupt change in the clay's characteristics due to depletion of the supplier's original reserves can needlessly disrupt casting operations in the future.

More than 200,000 tons of the finest collodial bentonite, YELLOWSTONE, are stockpiled at Magcobar's Greybull, Wyoming, facilities, along with more than 20,000,000 tons of the purest known western bentonite ore in reserve. The world's largest mine – the world's largest reserves!



DEMAND . . .

for Magcobar's YELLOWSTONE continues to increase as more and more progressive foundries discover that up to ten percent less of this pure, uniform clay is required. Uniform green strength, tensile strength and permeability are controlled at the plant to assure consistent specifications.

The next time you order bentonite, demand YELLOWSTONE Bentonite – your guarantee of dependable supply and uniform quality. Write for technical bulletins numbers 1 and 2 entitled "Bentonite Evaluation" and "Bentonite and the Muller."

YELLOWSTONE

BENTONITE

"OLD FAITHFUL"

MAGNET COVE BARIUM CORPORATION

Des Plaines, Illinois, 576 Northwest Highway
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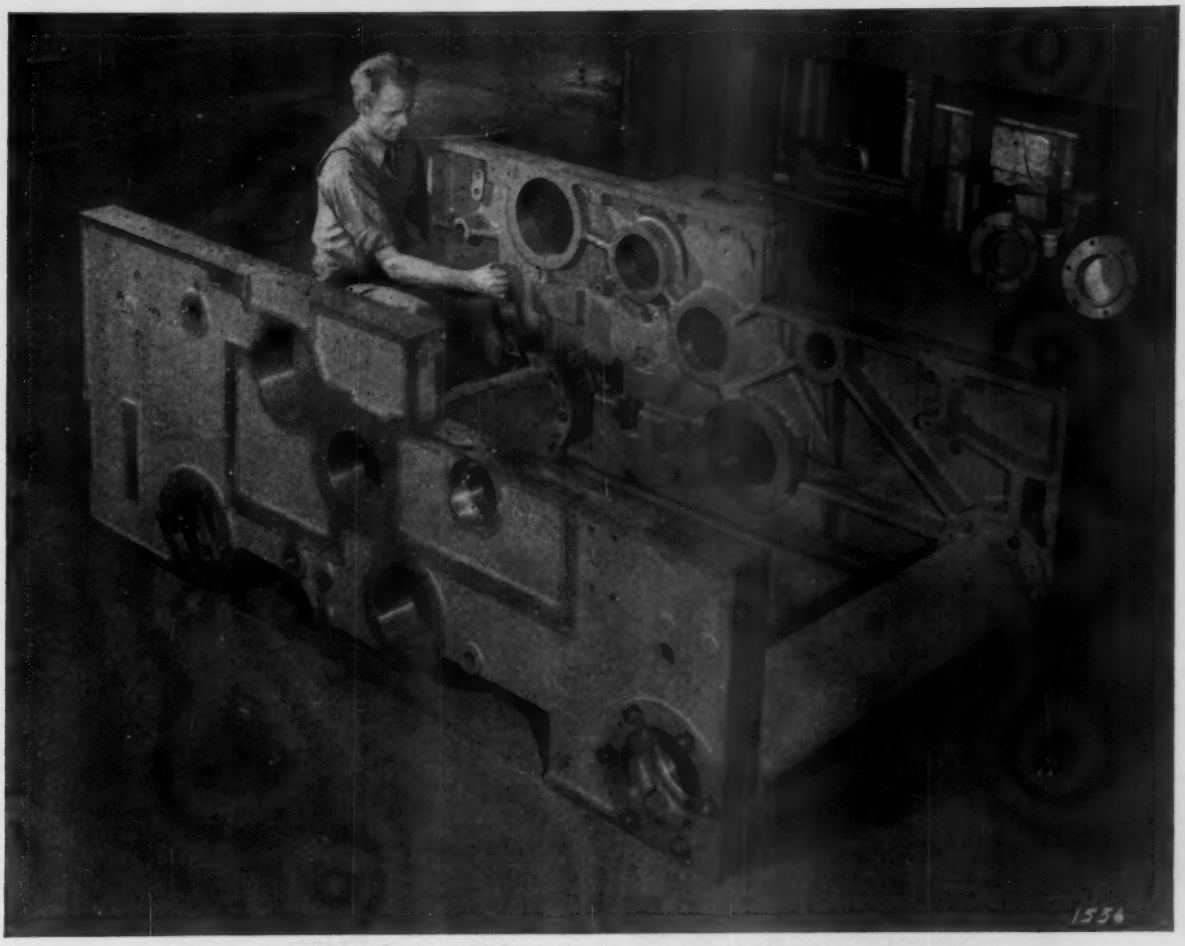
Greybull, Wyoming



1300 pound cast frame for large high speed bag-making machine. L. Brayton Foundry Co. uses a 1% nickel cast iron for frames to assure accurate alignment of shafts and cross members during assembly by St. Regis Paper Company, East Providence.

How nickel irons help you maintain control of large, complex castings

One of the easiest ways to obtain dimensional stability in a big, intricate casting is to use a nickel cast iron.

Take the matched frame members shown above, for example.

You'll see the problem right away. Unless cored holes and to-be-machined surfaces line up almost perfectly . . . up go machining costs.

Now notice the heavy bosses and ribs. And take note that the supporting web is ½-inch thin. You would expect some chill in this web and a tendency to warp. And you might forecast a costly stress relief or expensive set-up time in machining operations.

L. Brayton Foundry got around all this quite easily. By using a nickel cast iron mix, they were able to deliver these frames "as cast" and meet all requirements for dimensional accuracy.

Nickel irons give you more control over chill...help keep warping stresses low

Nickel cast irons show less tendency to chill. With these irons, structure is more uniform. Build-up of internal warping stresses in large, complex castings is not as high.

What's more, selection of the right grade of nickel iron gives you improved control over structure, and hence, machinability, wear resistance, strength and other properties desired by you and your customers.

Pass on to your customers the benefits of nickel cast irons

Next time you have an order coming up for a large, complex casting, look into the economics of nickel cast irons. You may be able (1) to reduce your own costs or (2) to provide your customer with a much better casting.

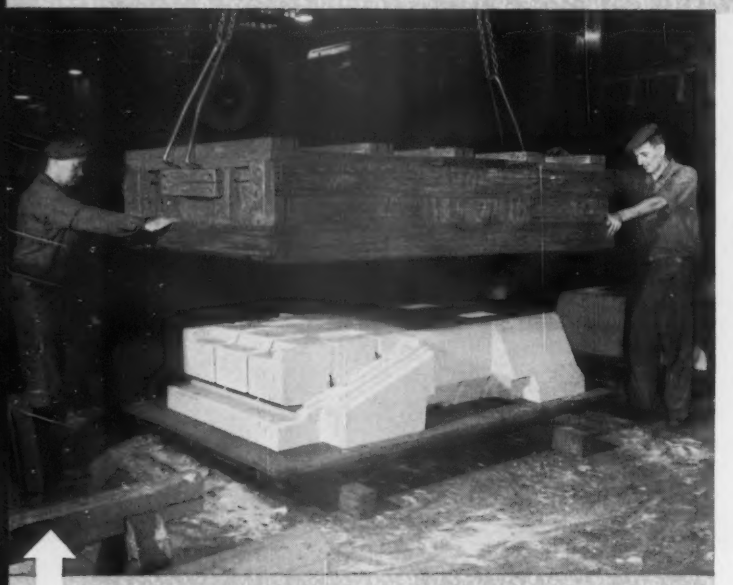
Maybe you can do both. The way to find out is to contact Inco. Inco's engineering service can help you . . . on either a special foundry problem or to help convince a customer.

THE INTERNATIONAL NICKEL CO., INC.
67 Wall Street New York 5, N. Y.

INCO
TRADE MARK

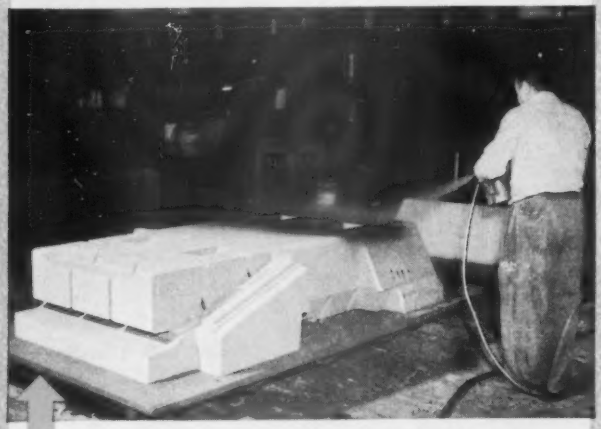
NICKEL CAST IRONS...*best for you because they're best for your customers*

HILL-ACME
reports on value of...



John Mokren and Joe Zargel, coremakers at Hill-Acme are stripping the box from a 3000-lb. LIN-O-SET core which is typical of much of the core work in this modern foundry. Two of these giants form the core assembly for a 3½-ton machine tool base pan casting. Note the delicate undercut on the left side of the core, which involved considerable time and trouble prior to the use of LIN-O-SET.

Otto Spirek, plant superintendent at Hill-Acme, discusses mixing procedures with Dan Chester, ADM Technical Service Mgr., who makes periodic checks on procedures, and stands ready to apply his specialized knowledge to core problems as they arise.



Hill-Acme castings are known for their excellent finish. They attribute this to high density of LIN-O-SET cores, and the use of FEDERAL No. 801 PLUMBAGO COREWASH. Illustration shows Paul Colella spraying on FEDERAL No. 801.

Circle 554 on Page 51

LIN·O·SET

½ the fabricating time
½ the baking time

...and vastly improved casting finish. These are the primary reasons why HILL-ACME COMPANY of Cleveland, Ohio, switched from conventional core oil to LIN-O-SET.

Larry Rayel, ADM Representative, suggested that Hill-Acme try LIN-O-SET as an experiment. The huge, complicated cores presented constant problems: for instance, they had to use back-up sand to reinforce delicate undercuts; it was difficult to hold dimensional stability and at the same time attain sufficient flowability for easy ramming; they had to "baby" green cores due to their extreme size and weight; then the large cores had to bake for two nights.

After a demonstration by ADM Technical Service Manager, Dan Chester, it was decided to put LIN-O-SET into the entire core operation.

Now, a year later, these are the recognized benefits: after a short air-curing period, core boxes are stripped faster and easier without danger to the core, and the core has absolutely no sag after stripping; there is less need for rodding; high green strength of the cores as drawn permits safer handling, reducing green core breakage; minimum ramming and tucking are required due to low green strength and high flowability of LIN-O-SET sand as discharged from the muller. All in all, total fabrication time for LIN-O-SET cores is estimated to be at least 50% less.

Baking time was reduced from two nights to one night. Excellent collapsibility of the cores reduces cleaning to a minimum.

Perhaps a demonstration of LIN-O-SET in your foundry will bring about attractive savings for you. Write for LIN-O-SET technical bulletin.

Archer QUALITY

Archer·Daniels·Midland company

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Aim toward better castings through the use of Archer Quality Supplies:

GREEN BOND H-J High-gelatinating Bentonite	**FEDERAL** Sand Stabilizer	**LINOIL** Core Oils	**ADMIREZ** Foundry Resins
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CROWN HILL Sea Coal	**FEDERAL** Plumbagos	**LIN-O-SET** Air-setting Core Binders	**LIN-O-CEL** Sand Stabilizer
	FEDERAL Core Pastes		**FRE-FLO** Parting Compound

FOUNDRY

A PENTON PUBLICATION

April 1958

Volume 86—Number 4

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Shell Molding—Ten Years of Progress 80

Special report studies present status and future of the shell molding process. Individual articles cover development of the process during the ten years since its inception in this country; comments by foundrymen on the future of the process; a discussion by suppliers of developments in resins and molding equipment; operating practices at five representative shell mold foundries; pattern equipment; and the processing of shell molding sand

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FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions.

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WHERE DO NEW IDEAS COME FROM? . . .

ideas that stand the test of time spring from the minds of men with the courage to lead — to pioneer in thought — to try the untried.

It was an idea such as these . . . a revolutionary new product . . . that brought Wheelabrator Corporation into being fifty years ago. And the intervening years record a steady procession of other successful developments . . . *firsts* in their field.

This pioneering, inventive spirit has permeated the organization since the early days of its founding. It is the heart of Wheelabrator's business philosophy . . . the reason for its growth and leadership.

Preserving this proud tradition is a constant challenge and a never-ending responsibility of the entire Wheelabrator family of pioneers.

they come from WHEELABRATOR®

In airless blast cleaning, the *new* ideas of today come from the originator of the process itself—Wheelabrator Corporation. Since its invention twenty-five years ago, the Wheelabrator has opened up a vast world of uses in many fields. Its history is one of challenges met and needs fulfilled.

When Wheelabrator developed the first mechanized Sandcutter for the foundry fifty years ago, it revolutionized a costly, back-breaking shoveling job that had existed for decades.

When Wheelabrator designed the first "Humane" Sand Blast Room and Cabinet, it filled still another need.

The Endless Belt Tumblast, the Continuous Tumblast, the Monorail Blast Cabinet, the Swing Table, the Multi-Table, Steel Abrasives, and dozens of other original ideas also resulted from Wheelabrator pioneering leadership.

Sensing problems . . . finding practical ways to solve them . . . pursuing the policy of progress through creative engineering . . . that's why the new ideas in blast cleaning come from Wheelabrator. And a good policy it is—for the next fifty years, too.

WHEELABRATOR corporation

505 S. Byrkit Street Mishawaka, Indiana

Canadian Offices: Scarborough (Toronto) Montreal

World's largest manufacturers of airless blast equipment and steel abrasives.

Circle 555 on Page 51

ADAMS CHERRY EASY-OFF FLASK

Custom Built in any Length, Width or Depth

These advantages will cut your production costs!

SIDES AND ENDS finished 1⅛" on all standard size flasks. 1¼" and heavier on flasks of larger perimeters and depths. Cherry lumber is finest available; air dried.

SOLID CORNERS are machine locked to maintain alignment and to insure maximum rigidity.

MALLEABLE TRIMMINGS are another famous Adams feature; assure long life and exceptional service.

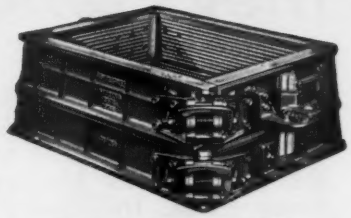
OPERATING MECHANISMS are completely new in design yet of proven construction. Exceptionally simple, offering single-point adjustment; ease of operation on tough jobs.

ADJUSTMENTS made *only* when mechanism is in *locked* position.

SPECIALLY DESIGNED INSERTS located in main body castings permit reversal of locking position. As "standard" flasks are furnished with handles locking in "up" position. To change, remove main bolt handles and inserts, reverse inserts and handles and reassemble.

STEEL PROTECTING STRIPS are standard equipment at top of cope, bottom of drag and at parting. Aluminum strips available upon request at no extra charge.

WIDE "V" PINS & EARS standard on all flasks. All other types of pin and ear arrangements are available to interchange with your present pattern plate guides.



Adams Aluminum Easy-Off Flask

Adams Jackets, Cast Iron or Aluminum

Adams Steel Jackets

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May 19-23 Cleveland, Ohio

The ADAMS Company

Dubuque, Iowa

1883 75 years of progress 1958

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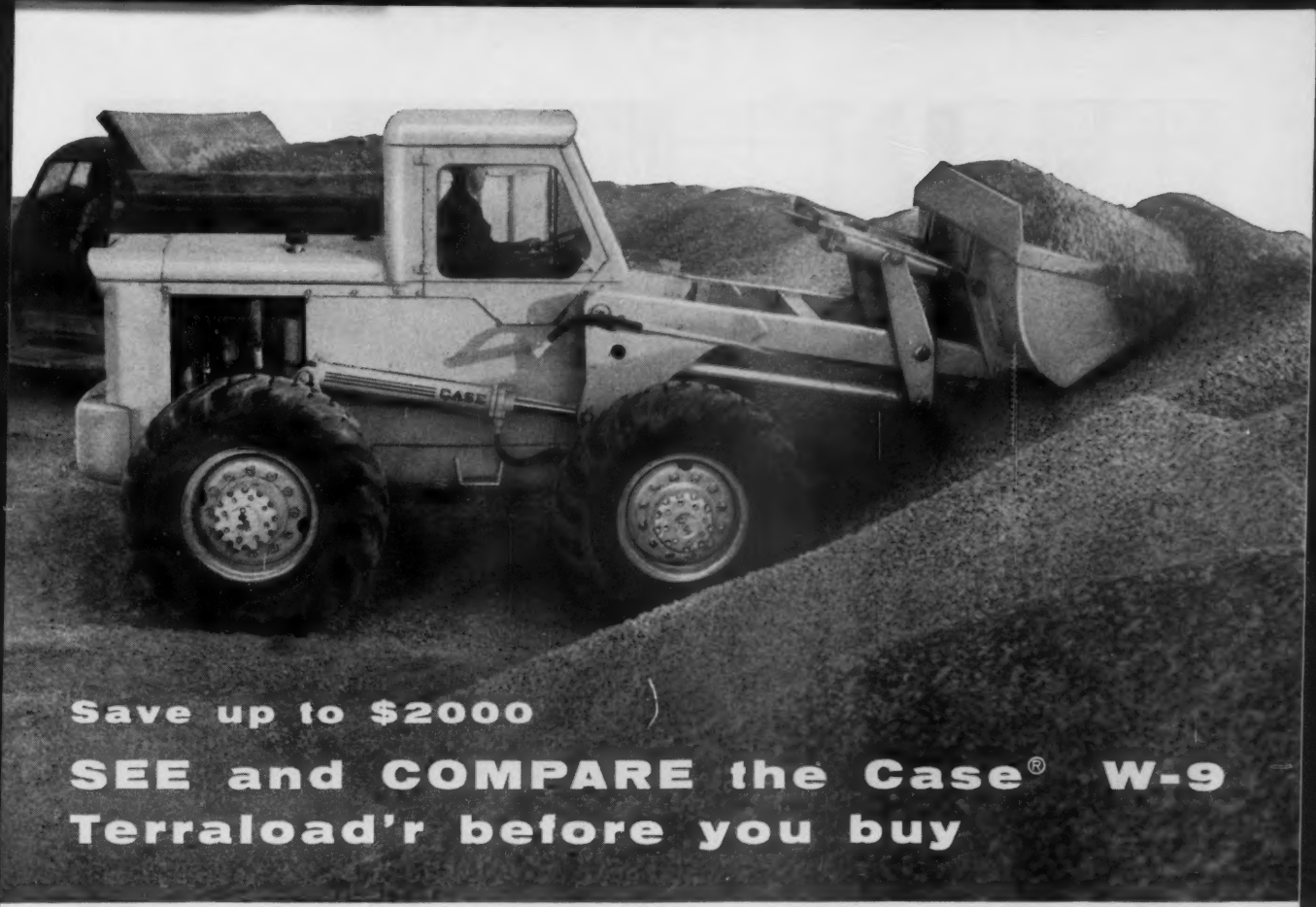
Circle 557 on Page 51→



Save up to $2000

SEE and COMPARE the Case® W-9 Terraloader before you buy

A free demonstration will quickly convince you that the new Case W-9 Terraloader will *outperform competitive four-wheel-drive loaders costing up to $2000 more.* Main reason is the W-9 has better balance and stability to maintain traction on all four drive-wheels, when digging or traveling with heavy loads. Short, rigid lift arms — pivoted AHEAD of operator — give *better visibility, increase dumping reach, and eliminate danger of catching operator's arm in lifting mechanism.*

Like other Case industrial wheel and crawler units, the W-9 Terraloader is sold and serviced under *one factory warranty,* by reliable Case heavy construction machinery dealers everywhere. Fifteen centralized Case industrial parts depots insure *fast delivery of parts anywhere in the U. S. and* Canada. Long-term financing and LEASE plans are also available to help you obtain *new* equipment *now* on easy monthly terms, without tying-up needed capital. Mail coupon for full details.

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- 11,000 lbs. break-out force, 5,500 lbs. carrying capacity
- Four-wheel-drive, with rear-wheel power-steering
- Power-boosting torque converter, plus full power-shift in all speed ranges, as well as forward and reverse.
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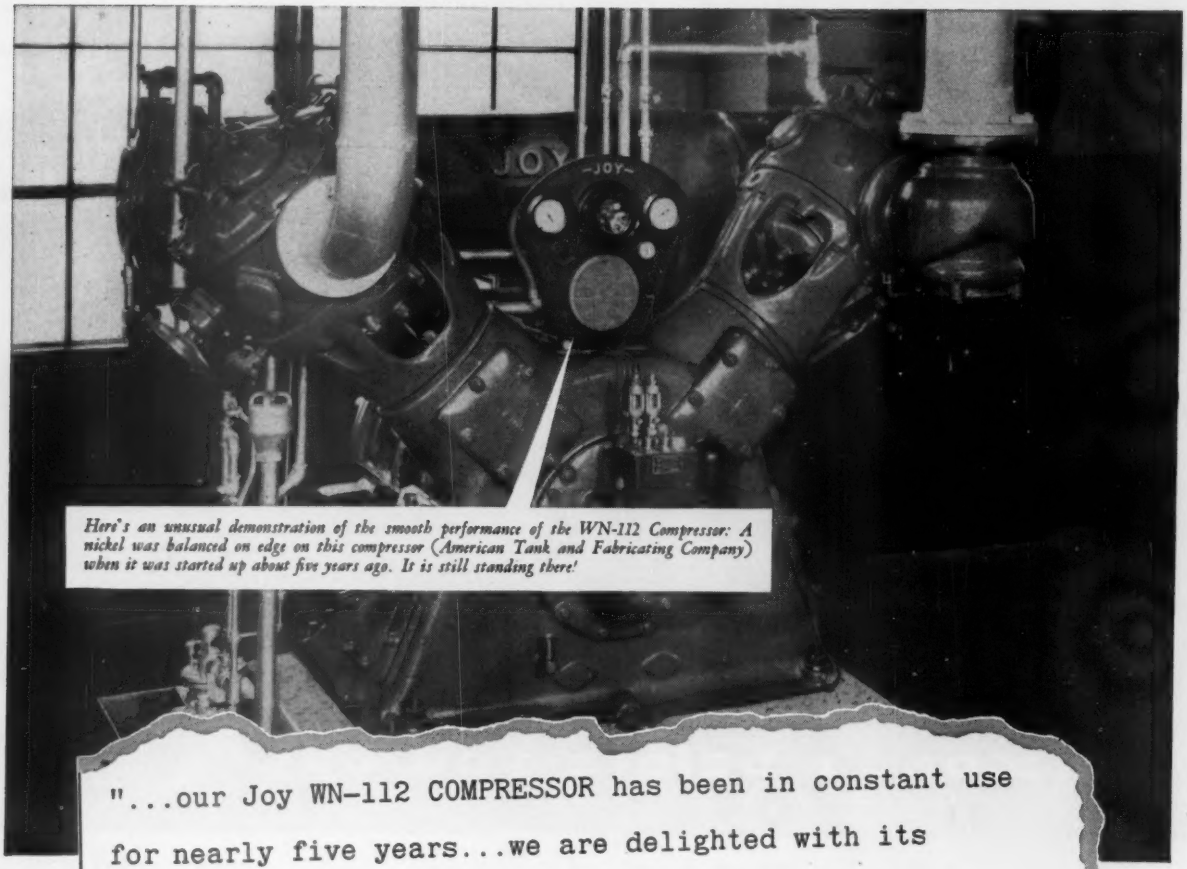

Here's an unusual demonstration of the smooth performance of the WN-112 Compressor: A nickel was balanced on edge on this compressor (American Tank and Fabricating Company) when it was started up about five years ago. It is still standing there!

"...our Joy WN-112 COMPRESSOR has been in constant use for nearly five years...we are delighted with its vibrationless performance."

George F. Franck, Vice President
American Tank & Fabricating Company,
Cleveland, Ohio

There's no better story than a satisfied customer—

Nearly five years of absolutely *trouble-free* service is a performance of merit for any continuous-operation machinery. As a matter of fact, though, many of the original Joy WN-112 Compressors, built *two decades ago,* are still giving dependable service to satisfied owners.

Joy pioneered the use of high-rotation speed in heavy-duty compressors . . . were the first to bring to industry the many advantages of this new concept. The V-vertical design with flange-mounted motor resulted in a *compact*, heavy-duty continuous-service compressor that minimized vibration and paid off in trouble-free air power for industrial plants everywhere.

For more information, write **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Co. (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 142-13

A complete 28 page description of the WN-112 Compressor . . . section drawings, specifications and other useful information on heavy-duty compressor design and selection.

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WBW 16412-142

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Foundrymen Prefer

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because . . .

1. It comes from the highest quality bentonite deposits in the world—with the largest reserves to assure uniform and continuing quality.
2. The high quality of the material plus the vast research facilities assure compliance with all Western Bentonite specifications.
3. The quality of material, reserves, and continuous technical research from the most modern foundry laboratories are backed by service from trained, experienced foundry engineers available at any time to work on your foundry problems.

VISIT BAROID AT ARENA BOOTH NO. 414, AFS CASTINGS CONGRESS AND FOUNDRY SHOW, CLEVELAND PUBLIC AUDITORIUM

National Western Bentonite is available from better foundry dealers everywhere.

BAROID DIVISION • NATIONAL LEAD COMPANY

332 South Michigan Avenue, Chicago 4, Illinois

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BAROID

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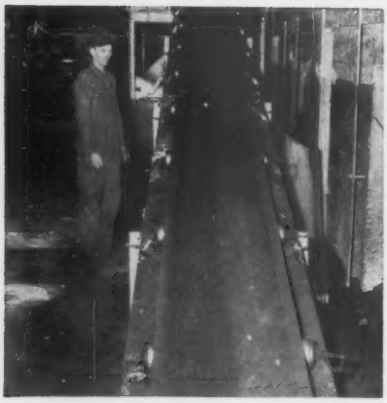

Previous belts lasted 9 months

. . . but this Imperial Insulated Sahara Belt has already been in service **22** *months!*

No wonder the foundry superintendent for Fairbanks, Morse Co. is a booster for Imperial* Insulated Sahara* Belting. For only a small difference in initial cost, he is getting three times the length of service obtained from belts previously used.

This conveyor is used on a high production schedule for handling hot shakeout sand. Temperatures frequently exceed 400° F. Imperial Insulated Sahara withstands this gruelling service because it is made from tight-woven heavy-duty hard silver duck, and protected against the destructive heat by asbestos insulation and a special impregnating compound.

Let Imperial's experienced engineers help you solve your hot belt problems. Call today, or mail coupon below for new Belting Catalog and Engineering Handbook.

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Imperial BELTING COMPANY

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You expect MORE from Imperial . . . and you get MORE!

Mail this coupon today for NEW Belting Catalog and Engineering Handbook

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Address_____

_____

Circle 560 on Page 51

With the Editors

ARE YOU?: Are You Paying for Equipment You Don't Have?" This is the question the editors have asked a number of leading foundrymen in all branches of the industry. To get an over-all idea of the general thinking on this problem, we requested opinions on the following:

1.—Your philosophy on the replacement of worn or obsolete equipment, and on further mechanization of any operation; 2—Your methods of determining when machines should be replaced or when further mechanization is advisable; 3—Actual examples of how such a determination was made and some idea of results achieved; 4—General comments on the entire subject. The response has been generous. In addition, we asked a number of foundry equipment manufacturers to give their ideas on the subject.

These comments, together with articles dealing with several phases of the subject, will be presented in the May, Preconvention issue. To foundrymen interested in cutting costs and in preparing for a greater demand for castings, which is bound to come, this special study should prove valuable.

The issue also will present extensive information on the important AFS Congress and Foundry Show to be held in Cleveland, May 19-23. Details of the technical program, plant visitation, social features, and a list of those firms which will maintain exhibits will be included.

In addition, the issue will carry other feature articles on various phases of foundry practice and the regular departments which add to the value of each issue of FOUNDRY.

The editors hope you will be watching for the May issue.

—o—

Reports in July: With the AFS Congress and Foundry Show scheduled for May 19-23, it will not be possible to carry the reports of that affair in the June issue. Printing schedules require the June issue to start going to press the week before the Cleveland affair opens so July will be the Postconvention issue. Complete reports of convention activities will be presented.

—o—

Lagging Productivity: Down in Washington politicians seem to be running scared. Everyone is demanding immediate action and the spending of huge sums of money to turn the recession. Undoubtedly the money will be spent.

Regardless of the success of this "do something quick" philosophy, these methods probably will not get to one cause of our present troubles. Rapid increases in wages without compensating growth in productivity have carried prices of many commodities higher than what the public will pay. While it is political dynamite, some attention must be paid to this factor by Washington if any recovery is to be lasting.

—o—

Break It Up: If we had a "How silly can you get" department, the prize this month would go to Air Force Secretary James Douglas for his statement in referring to the petition to void the court martial conviction of Gen. William (Billy) Mitchell which took place 33 years ago. While admitting that the general's views have been vindicated and that his vision concerning the future of air power was amazingly accurate, the air secretary indicated that the finding of the court martial that General Mitchell conducted himself to the prejudice of good order and military discipline and in a way to bring discredit on military service must stand.

Just who brought discredit on the military service? General Mitchell or the unimaginative, pompous, self centered, clique of superior officers more interested in maintaining the security of the military fraternity, than boldly protecting the security of the United States? Let's find a way for a military man with ideas to express them without ruining his career.

—o—

100 Years: An attractive booklet entitled "One Hundred Years of Service" and commemorating the 100th year of I. S. Spencer's Sons Inc., Guilford, Conn., recently crossed my desk. The booklet tells how Isaac Stowe Spencer started a foundry in Guilford in 1857, how it was continued by his sons and grandson, how it was acquired by Harry F. Sweitzer in 1945 and how a brother, Robert W. Sweitzer and his son Robert G. Sweitzer joined the organization and now are

If you're in a hole . . .

. . . .BECAUSE OF HIGH CLEANING ROOM COSTS, there's an easy way to cut snagging time and get back on top of the situation. Switch to CINCINNATI (PD)° SNAGGING WHEELS, the greatest grinding development in years.

It doesn't take any digging to find out what our customers think of CINCINNATI (PD) SNAGGING WHEELS. They're outspoken in their praise of the fast, easy cutting action. Our customers report, too, that POSITIVE DUPLICATION (PD) means another saving. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

CINCINNATI (PD) WHEELS are made in vitrified and resinoid bonds for both ferrous and non-ferrous foundries and are available in a complete variety of sizes and shapes. *And these better, cost-cutting* (PD) SNAGGING WHEELS *are priced no higher than ordinary wheels.*

So, if you want back on solid ground again, see your CINCINNATI Grinding Wheels Distributor. Or, contact us direct. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

(PD) POSITIVE DUPLICATION.

CINCINNATI° *Grinding Wheels*

°Trade Mark Reg. U.S. Pat. Off.

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

Engineered for longer crucible life!

■ In the Oil Fuel models, as shown, the special higher-pressure mechanical atomizing oil spray—a Hausfeld exclusive—produces a clear, hot flame with minimum cutting action . . . *increases* crucible and lining life.

■ Well insulated lining assures uniform heat dispersal—cuts heat loss and assures many years of fast, efficient melting of brass and bronze.

With crucible sizes from #10 to #400 . . . capacities 30 lbs. to 1200 lbs. brass and bronze (copper alloys) there is a Hausfeld Stationary Crucible Furnace to meet your non-ferrous melting needs. Write today for Bulletin #102. The Campbell-Hausfeld Co., 300 Moore St., Harrison, Ohio.

interchangeable for OIL or GAS FUEL

Hausfeld STATIONARY CRUCIBLE FURNACES

See Hausfeld equipment at the American Foundrymen's Convention, Cleveland . . . Booth 1658.

CAMPBELL-HAUSFELD
METAL MELTING FURNACES

active in the management of the company. Quality of workmanship and product in the field of light gray iron and nonferrous castings, it is pointed out, has permitted the company to build high regard and respect between company and customers over the years.

Congratulations to I. S. Spencer's Sons Inc. and its subsidiary, Colonial Brass Craftsmen, on the 100th anniversary.

—o—

Salesmen Are Traveling: Orders are much harder to get, but salesmen are doing something to overcome the problem. According to Emkay, a large auto fleet leasing firm in Chicago with approximately one-eighth of its cars in the metal products industry, average monthly mileage of salesmen has been gaining steadily since midsummer. In June the average was 2006 miles, in December, 2419 miles.

Let us hope foundry salesmen are doing better than the average general increase.

—o—

Rugged Castings: Some of our progressive foundries are quick to follow up the potential created by new projects. For example, Racine Steel Castings Co., Racine, Wis., looking toward the tremendous federal road building program, has prepared an attractive and well illustrated folder telling about "Rugged Castings for Rugged Road Builders."

The text points out that "Steel castings have proved equal to all requirements for field service under most rugged conditions of military and commercial duty."

Also that "The best time to let us work with you on steel castings is when they are at the planning or design stage."

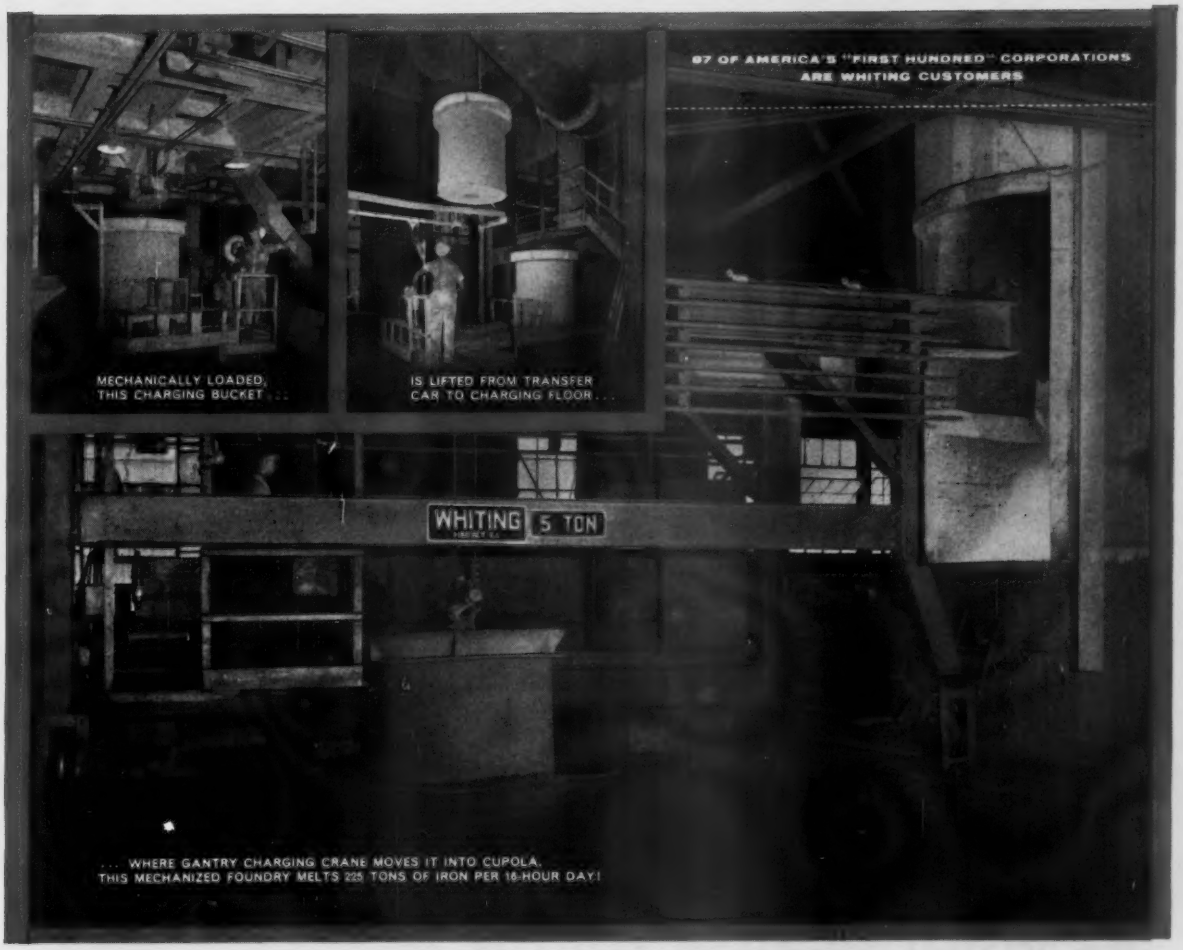
—o—

Shell Molding Story: The 30-page special editorial study on Shell Molding, presented in this issue, has been made possible through the kind assistance of many people. A sizable number of foundrymen, including all major producers of shell molded castings, gave us information on what they are doing with that process. They told us about their problems and their ideas of the future potentials of shell molded castings. Manufacturers of resins and equipment for shell molding wrote us at length on their ideas of what the future holds of the process.

The editors appreciate greatly all of this help, and believe the readers of FOUNDRY will find this special study most interesting.

F.G.S.

Circle 562 on Page 51


MECHANICALLY LOADED, THIS CHARGING BUCKET . . .
IS LIFTED FROM TRANSFER CAR TO CHARGING FLOOR . . .
87 OF AMERICA'S "FIRST HUNDRED" CORPORATIONS ARE WHITING CUSTOMERS
WHITING 5 TON
. . . WHERE GANTRY CHARGING CRANE MOVES IT INTO CUPOLA. THIS MECHANIZED FOUNDRY MELTS 225 TONS OF IRON PER 16-HOUR DAY!

At American Standard... Charging time cut one-third!

New mechanization at American Radiator and Standard Sanitary Corporation, Baltimore, has resulted in an immediate ⅓ reduction in charging time! Here, in a refurbished foundry, Machine Age speed is accompanied by economy and reliability. A Whiting Yard Crane now unloads scrap metal . . . and Whiting Cupolas, Ladles, Weigh Hoppers and a Gantry Charging Crane team up to produce more, and produce it faster. Practical allocation of manpower helps American-Standard pare its over-all production costs even more!

Learn about the advantages gained when you use foundry equipment designed for your needs. Write for the Booklet, "Whiting Foundry Equipment." Whiting Corporation, 15607 Lathrop Avenue, Harvey, Illinois.

WHITING FOUNDRY EQUIPMENT

MANUFACTURERS OF CRANES; TRAMBEAM HANDLING SYSTEMS; TRACKMOBILES; FOUNDRY, RAILROAD AND CHEMICAL PROCESSING EQUIPMENT

WHY PAY MORE

when you can buy the best binder at the lowest price!

INSIST ON STEINEX

the original CO_2 Binder available

only **from Carver**

BEST QUALITY Steinex gives you absolutely the best shakeout — BY FAR!

BEST PRICE Steinex is 30% lower in cost than any other binder on the market!

BEST SERVICE Carver has the in-the-foundry experience and know-how to help you use Steinex in your CO_2 operation — successfully and profitably!

JOIN THE HUNDREDS OF FOUNDRIES THAT INSIST ON THE BEST

MAIL TODAY

CARVER FOUNDRY PRODUCTS CO.
Muscatine, Iowa

RUSH information and prices on Steinex binders.

NAME _____ TITLE _____

FOUNDRY _____

CITY _____ STATE _____

Calendar of MEETINGS

Apr. 8—Material Handling Institute, spring membership and directors meeting, Cleveland Hotel, Cleveland.

Apr. 9-10 — Malleable Founders' Society, Market Development Conference, Edgewater Beach Hotel, Chicago.

Apr. 14-17—Design Engineering Show, International Amphitheatre, Chicago.

Apr. 21-26—American Industrial Hygiene Association, annual meeting, Claridge Hotel, Atlantic City, N. J.

May 5-6—American Institute of Mining, Metallurgical & Petroleum Engineers, conference on properties of high-strength steels, Penn-Sheraton Hotel, Pittsburgh.

May 8-9 — Magnesium Association, annual closed meeting, Grove Park Inn, Asheville, N. C.

May 8-9—Refractories Institute, annual meeting, Homestead, Hot Springs, Va.

May 8-10—American Material Handling Society, western regional material handling show, Great Western Exhibit Center, Los Angeles.

May 12-16—American Society for Metals, 1st southwestern metal congress and exposition, Automobile Bldg., Dallas, Tex.

May 13-15 — Investment Casting Institute, spring meeting, Edgewater Beach Hotel, Chicago.

May 14-16—Society for Experimental Stress Analysis, spring meeting, Manger Hotel, Cleveland.

May 19-20—Non-Ferrous Founders' Society, annual meeting, Carter Hotel, Cleveland.

May 19-23—American Foundrymen's Society, 62nd annual convention and exhibition, Public Auditorium, Cleveland.

June 9-10—Malleable Founders' Society, annual meeting, Homestead, Hot Springs, Va.

June 9-12—National Materials Handling Exposition, Public Auditorium, Cleveland.

June 12-13 — American Foundrymen's Society, annual chapter officers conference, Hotel Sherman, Chicago.

June 19-21—American Foundrymen's Society, foundry instructors seminar, Case Institute of Technology, Cleveland.

June 22-27—American Society for Testing Materials, annual meeting, Statler and Sheraton-Plaza Hotels, Boston, Mass.

Sept. 10-11—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 15-19—Instrument Society of America, annual instrument - automation conference and exhibit, Convention Hall, Philadelphia.

Sept. 22-23—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Oct. 8-10—Gray Iron Founders' Society, annual meeting, Sheraton Park Hotel, Washington.

Oct. 15-16—Michigan Regional Foundry Conference, University of Michigan, Ann Arbor, Mich.

Oct. 16-17—All-Canadian Foundry Conference, Royal Connaught Hotel, Hamilton, Ont.

Oct. 16-18—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 17-18—New England Regional Foundry Conference, Massachusetts Institute of Technology, Cambridge, Mass.

Oct. 18-21—Conveyor Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 27-31—American Society for Metals, national metals exposition and congress, Public Auditorium, Cleveland.

Oct. 30-31—Metals Casting Conference, Purdue University, Lafayette, Ind.

Oct. 31-Nov. 1—Northwest Regional Foundry Conference, Multnomah Hotel, Portland, Oreg.

Nov. 10-12—Steel Founders' Society of America, technical and operating conference, Carter Hotel, Cleveland.

Nov. 20-21—National Foundry Association, annual meeting, Drake Hotel, Chicago.

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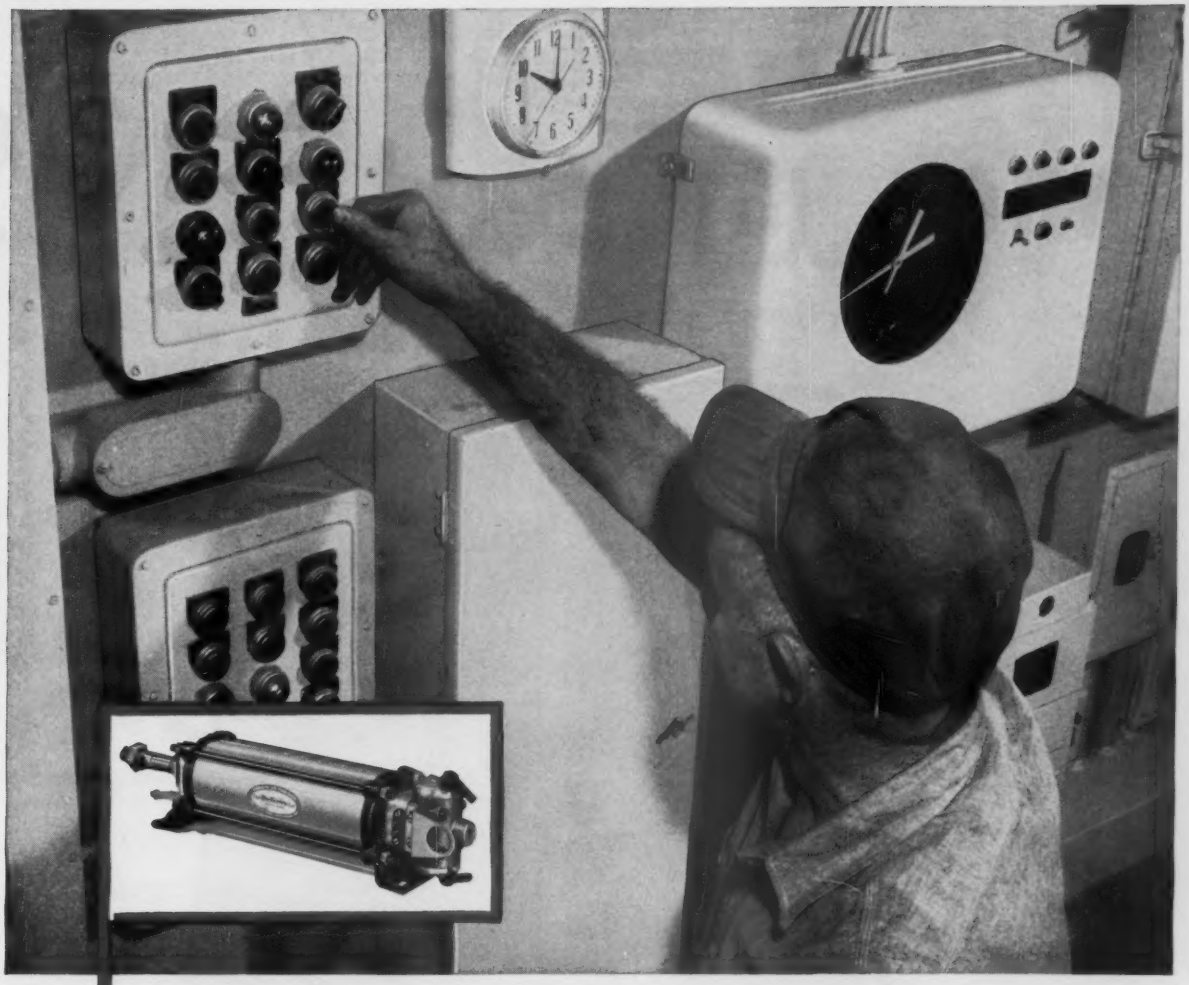


THE BELLOWS AIR MOTOR PUTS PRACTICAL AUTOMATION WITHIN THE REACH OF EVERY FOUNDRY

A Bellows Air Motor can do the push and pull, lift and turn work in many foundry operations . . . and do it in less time and at less cost.

The picture shows a typical example:

Proportioning and feeding mold sand materials to mullers with hand shovels is common practice in many foundries. Wehr Steel Co. of Chicago, decided its costs for this work were too high. Automatic dispersal of the materials was accomplished with a company designed storage and feeding system.

Now as the mullers need material, an operator provides it by pushing buttons . . . Bellows Air Motors do the work of opening and closing five storage bins located two stories above the mulling floor.

In your operations, too, there are scores of ways in which these ingenious air cylinder power units can be combined with a little imagination to save money. Packing a lot of "controlled power" in a small space, Bellows Air Motors will perform virtually any pull, push, lift or turn motion quicker, safer and more reliably than it can be done by hand or by cams, gears, levers or other mechanical aids. They put practical cost-saving automation within easy reach of every size foundry.

Your Bellows Field Engineer (listed in the phone book under The Bellows Co.) will be glad to discuss possible applications with you. Or write The Bellows Co., Dept. FO-458, Akron 3, Ohio, for copies of Bulletins ML-3 and BM-25. In Canada, address Bellows Pneumatic Devices of Canada, Ltd., Toronto 18.

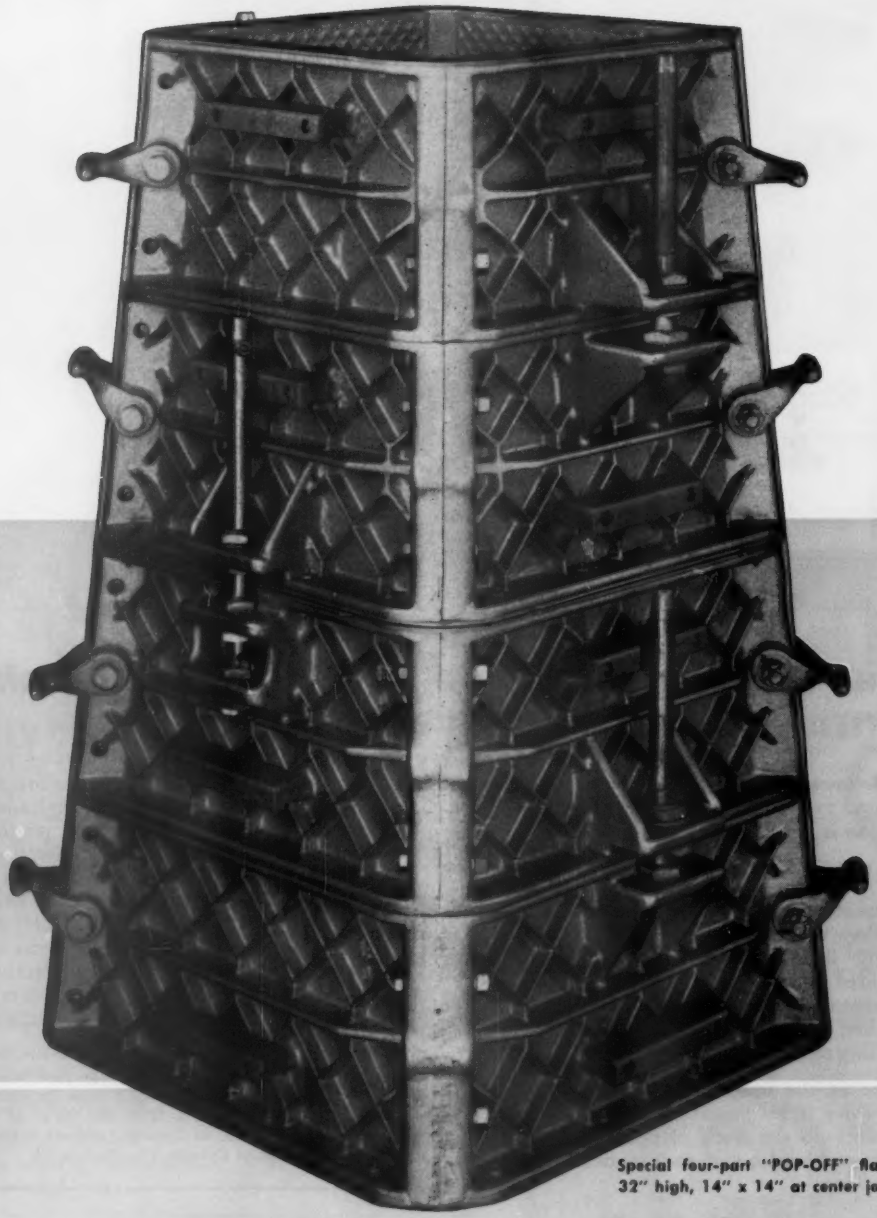
The Bellows Co.

DIVISION INTERNATIONAL BASIC ECONOMY CORPORATION

AKRON 9, OHIO

1067-B

when you need FLASKS



Special four-part "POP-OFF" flask, 32" high, 14" x 14" at center joint

...you're better off with "POP-OFF"

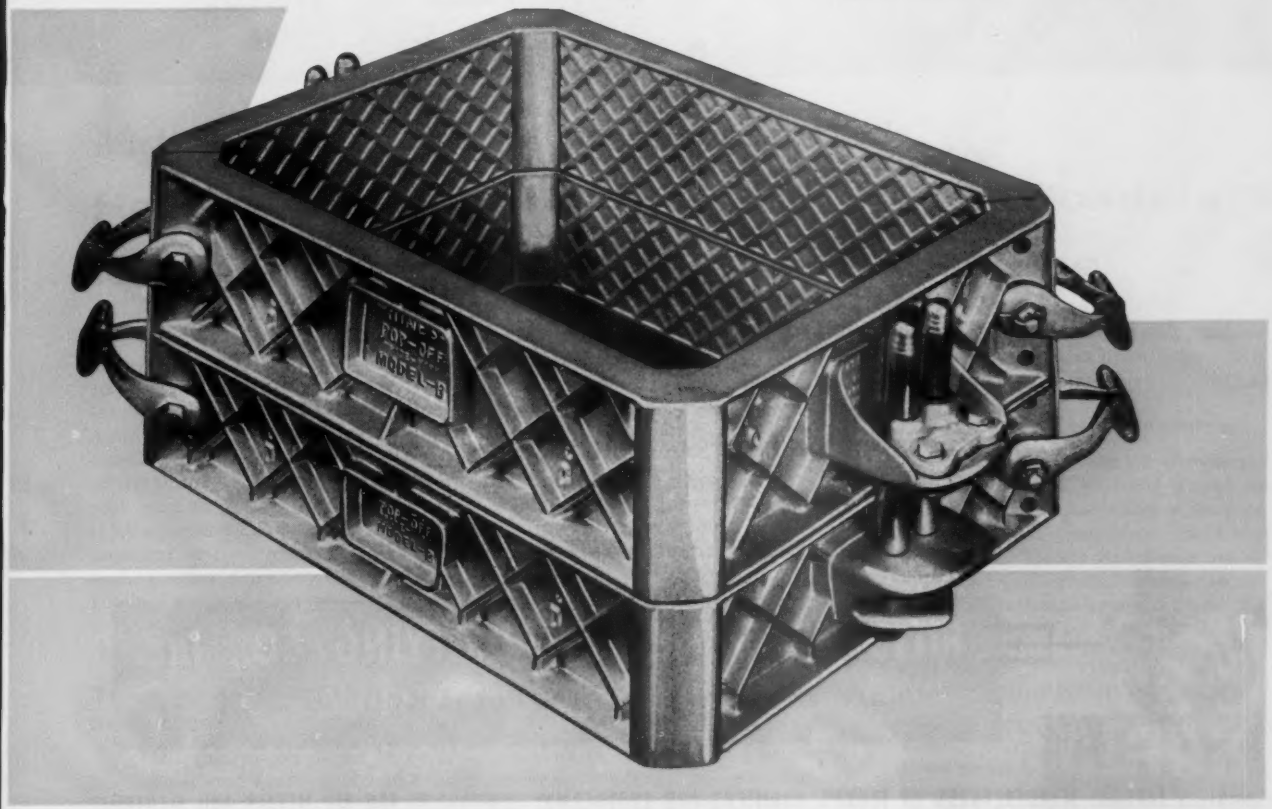
HINES FLASKS

HINES POP-OFF FLASK

THE HINES FLASK CO.

3431 WEST 140th STREET
CLEVELAND 11, OHIO

Standard aluminum "POP-OFF" flask, light in weight, extremely durable



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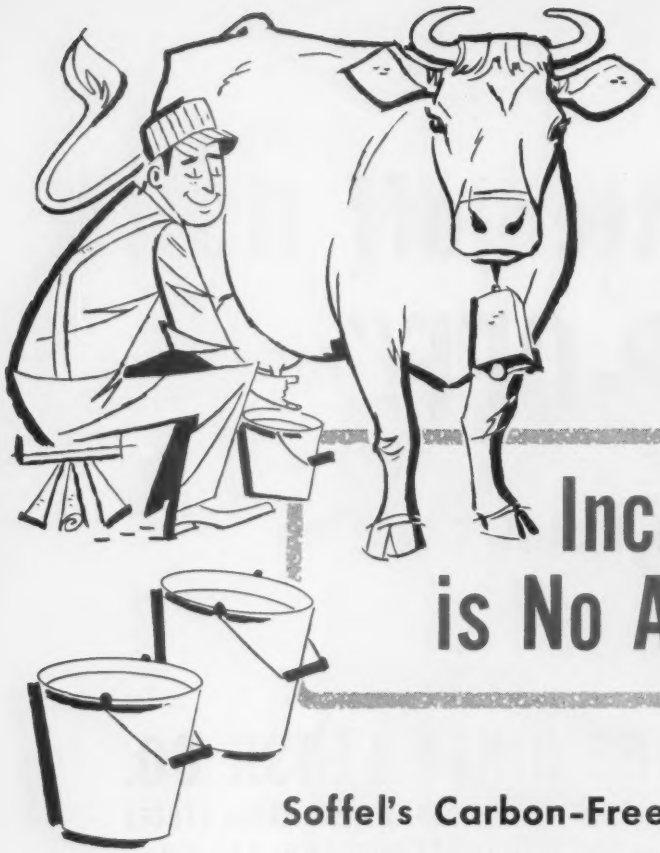


Increased Yield is No Accident!

Soffel's Carbon-Free Liquidizer Is TOPS . . . To Assure Adequate "FEEDING" Metal When It Is Needed!

SOFFEL'S Exothermic Carbon Free Liquidizers for Iron, Steel, Nodular Iron and Non-ferrous Alloys are scientifically designed to enable you to drastically reduce the size of your feeding heads on any type casting. It is a patented exothermic compound free of carbon or any other element which could contaminate any type of alloy.

By the use of Soffel's Carbon Free Liquidizers, you can obtain more sound, shrink-free castings than ever before from each ladle of metal poured. We welcome the opportunity to have a Soffel Sales Engineer prove to you why Soffel's Carbon Free Liquidizers are really TOPS for increasing yields and solving troublesome feeding problems.

Let's All Meet in Cleveland, May 19, 1958!

PITTSBURGH METALS PURIFYING CO., Inc.

Mars, Pennsylvania • Phone: National 5-5800

"WORLD'S LARGEST MANUFACTURER OF FLUXES, PURIFIERS AND EXOTHERMIC COMPOUNDS FOR ALL METALS AND ALLOYS"

Michigan Model 12B handles 300 tons of sand daily . . .

Hewitt-Robins foundry formerly needed 2 loaders to keep up with muller—now does it with one

Until a year ago, the Jones Machinery Division of Hewitt-Robins, Inc. required two industrial tractor shovels to load foundry sand into the muller and distribute it to molding stations. One loader couldn't keep up with the muller, so the second loader was needed during peak periods. When management decided to replace their oldest loader, they requested on-the-job demonstrations of leading makes. After they had seen them all, they bought a Michigan Model 12B. It could keep up with the muller by itself, even during peak periods.

Travels 300 ft through narrow aisles

The principal job of the 16 cu ft Michigan is sand handling. Round trips from muller to molding stations average 300 ft through narrow aisles and supporting columns. The Model 12B handles 300 tons of sand per day: loads 105 tons into muller, distributes 90 tons to stations (balance goes by over-head crane and sand slinger) brings back 105 tons of burned-out sand to the pile. The Model 12B just "walks" into the sand, works bucket and comes out with heaping loads. With power-shift transmission, the Model 12B gets in and out fast, saves vital seconds on every cycle.

Why Hewitt-Robins bought the Michigan

The management group agreed the Michigan was "an excellent machine for the money"—and that its 20 per cent greater weight and power than most machines in its class would help speed material handling. In addition, the Model 12B was the only Tractor Shovel in its size-range with power-shift transmission which eliminates clutch pedal and engine clutch; and the only machine with planetary-wheel drive axle, which eliminates broken axles.

How to buy a tractor shovel

During its on-the-job demonstration, the Model 12B *clearly* proved its ability to move more tonnage at less cost. Make your own comparison: don't buy an industrial Tractor Shovel until you've seen Michigan in action. Write to arrange a demonstration—you name the jobs you want to see done!

Michigan is a registered trade-mark

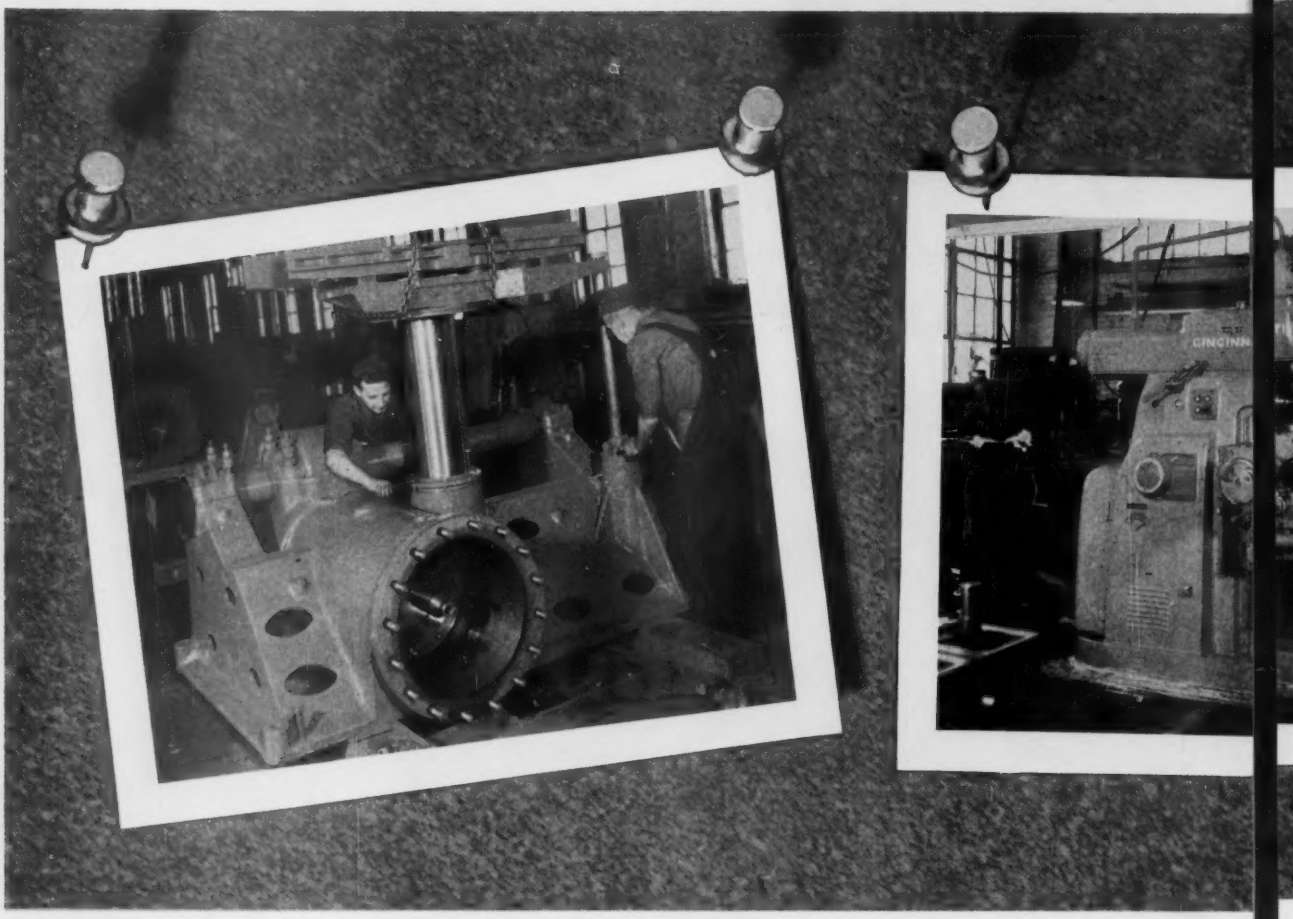
CLARK EQUIPMENT COMPANY

2475 Pipestone Road
Benton Harbor 5, Michigan

CLARK® EQUIPMENT

In Canada:
Canadian Clark, Ltd., St. Thomas, Ontario

Circle 568 on Page 51



they've made their way... by the way they're made

There are a lot of good reasons why this statement has been synonymous with Herman molding machines for over 50 years.

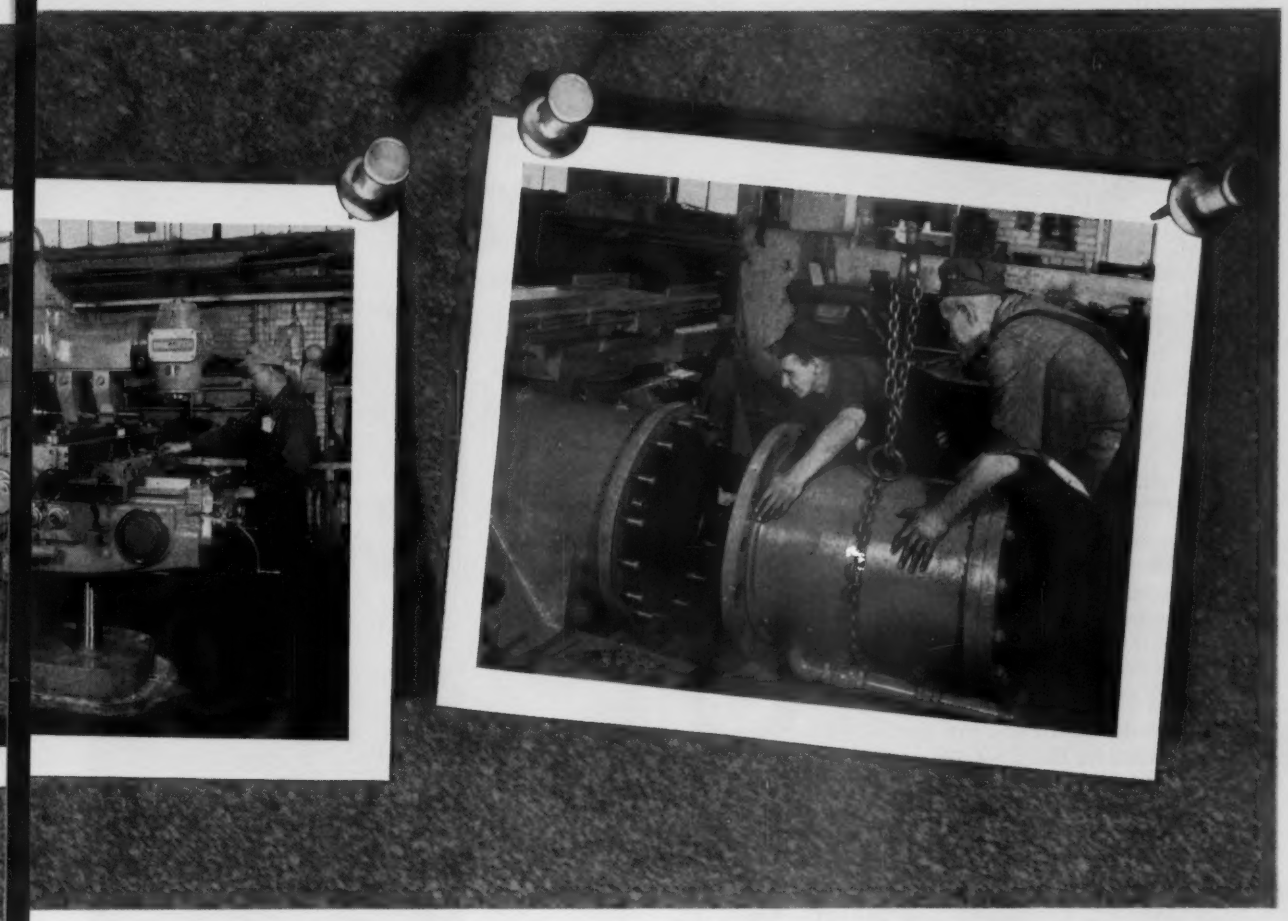
Just a few include Liaison Engineering discussed in earlier ads; precise inspection technique; our detailed attention to components.

We also take a really close look at our electrical and hydraulic equipment, when we manufacture and assemble a Herman. It pays dividends to the foundry operator, in terms of longer life, more rugged duty, and increased safety.

Solenoid valves, for example, relays, limit switches and central control panels are absolutely dust-proof, built to JIC standards, and are the best possible equipment on the market.

Packaged bearings used in all component parts have the latest, most up-to-date seals. On

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.



certain installations, our people work with the engineering departments of supplier-companies to develop better sealed bearings which can take typical foundry punishment.

Packings are carefully adjusted by pre-setting and testing through the complete cycle, to guarantee good operation.

Modern tooling throughout our plant guarantees top quality workmanship and extreme accuracy.

Even our push buttons are rubber-covered, and have a seal within a seal for increased operator-safety against shorting.

It's this type of close attention which has helped Herman Molding Machines Make Their Way By The Way They're Made.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

HERMAN

Best Known Name in Molding Machines

Circle 569 on Page 51

COLEMAN OVENS

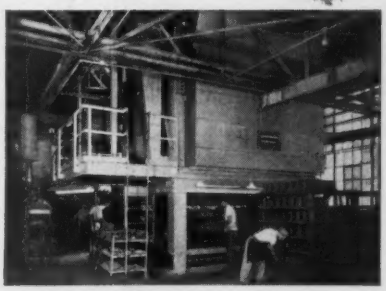
turn minutes into money...

Fast, efficient production of uniformly good cores and molds is vitally important to foundry profits.

When you use old, out-dated core and mold ovens the minutes and hours lost in costly rejects and make-overs . . . the time and effort lost in wasted man power, the production lost in casting scrap eat your profits away. Modern design and exclusive advantages of Coleman Ovens result in immediate production economies, reducing overall core department costs by as much as 50%! Such savings mean increased profits and rapid investment amortization.

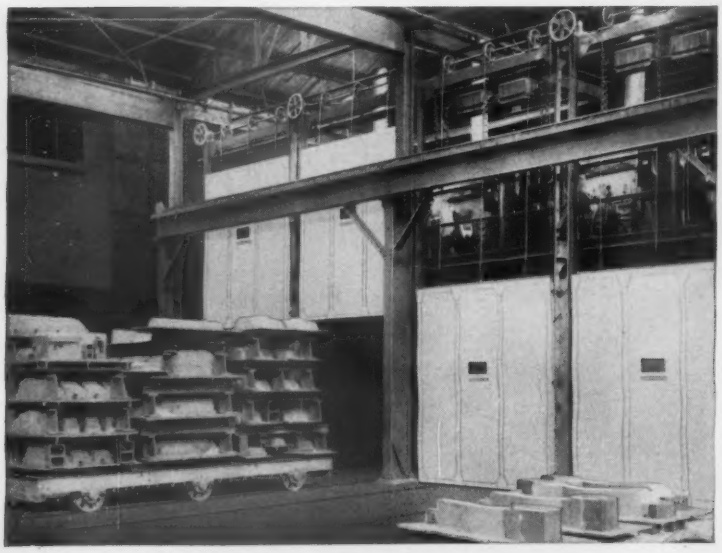
More than half a century of specialized foundry oven experience is your assurance that the Coleman Oven recommended to you will do your work to your complete satisfaction. ***As builders of the world's only complete line of foundry ovens we have no reason to recommend any but the best for your purpose.*** Let our experienced engineers give you practical suggestions for your particular requirements.

WRITE FOR BULLETIN 54



Coleman Tower® Oven

Coleman Transrack Ovens



Coleman Car-Type Core Ovens

Coleman Dielectric Oven

A COMPLETE RANGE OF TYPES AND SIZES . . .
for every core baking and mold drying requirement:

Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers
Dielectric Core Ovens

THE FOUNDRY EQUIPMENT COMPANY
1821 COLUMBUS ROAD CLEVELAND 13, OHIO

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

This Recuperative Atmosphere Rotary Scale-Free Heating Furnace, manufactured by The Lithium Company, Newark, N. J., employs Norton segmented conduits — *engineered and prescribed* CRYSTOLON tongue and groove tiles. Other Norton refractory shapes in the furnace are ALUNDUM burner blocks — equally efficient in aiding Lithium's recognized advancement in many heating operations.

Lithium Company reports advantages of Norton refractories

CRYSTOLON and ALUNDUM* shapes provide long, trouble-free service*

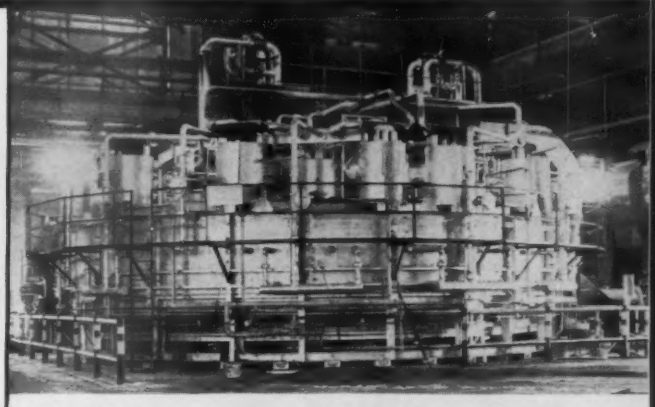
Selected by The Lithium Company for hot strength, high refractoriness, thermal conductivity and low thermal expansion, segmented conduits made of Norton CRYSTOLON tile give long, trouble-free service at temperatures up to 2900°F. ALUNDUM burner blocks have the same useful qualities, plus resistance to chemical attacks at temperatures up to 3450°F.

To Improve Your Own Furnace Performance

See your Norton Representative or *write for descriptive literature* to NORTON COMPANY, Refractories Division, 303 New Bond Street, Worcester 6, Mass.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

Circle 571 on Page 51



One of a group of Recuperative Rotary Forging Furnaces installed by Lithium Company in a leading automotive plant for the production of *scale-free heated* billets to temperatures of 2400°F.

NORTON

REFRACTORIES

Engineered... Rx ...Prescribed

Making better products . . . to make your products better

NORTON PRODUCTS:

Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING DIVISION:

Coated Abrasives • Sharpening Stones • Behr-cat Tapes

ACHESON

dispersions digest

Reporting uses for

dag® BRAND DISPERSIONS

COLLOIDAL GRAPHITE, MOLY-SULFIDE, VERMICULITE, AND OTHER SOLIDS

'DAG' DISPERSIONS – THE ANSWER TO LOWER COSTS, BETTER CASTINGS

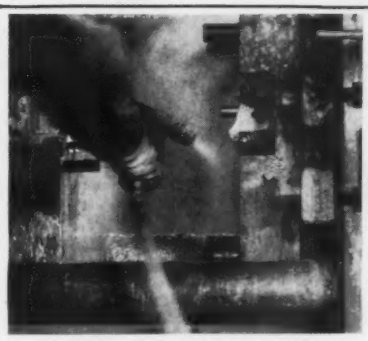
Acheson dispersions have proved themselves to be particularly effective as die and mold cavity coatings. They contain heat-resistant solid particles so finely divided that they remain in suspension for extended periods, making continuous agitation unnecessary. This fineness is an important characteristic because the films formed with these dispersions are so thin that they do not affect casting dimensions. As described in the following application case histories, both colloidal and semi-colloidal dispersions provide excellent parting, high-quality surface finishes, and longer die life. The consistent uniformity of 'dag' dispersions is your assurance of uniform castings.

A 'dag' 193 wash sprayed on mold cavities at Rapidscast Corporation gives them aluminum permanent mold castings of more uniformly high quality.

"We're sold on 'dag' 193 because it's consistent", states Robert Cope, president of Rapidscast Corporation, Grand Rapids, Michigan. After trying 22 mold wash combinations with as many different characteristics, Mr. Cope settled on 'dag' 193 — an Acheson vermiculite dispersion with a water carrier. Why? . . . Because of its completely uniform consistency, 'dag' 193 can be easily mixed to the three dilution ratios Rapidscast uses to obtain the required variance in film thickness throughout their molds. The unbroken film provided by this dispersion acts as a heat-holding blanket which helps to prevent "shrinks" or vacuum holes caused by uneven cooling of the molten metal. Also important to Rapidscast is the durability of a 'dag' 193 film coating. One application generally lasts through an entire molding day of three shifts, except for occasional touch up at wear points. And this uninterrupted production is a "must" since Rapidscast supplies such demanding customers as the automotive, aircraft, hydraulic, marine and appliance industries.

You'll find that Acheson processing methods produce dispersions of finer quality and more versatile use. Call your Acheson Service Engineer today for more specific information on the use of 'dag' dispersions. Or write direct for additional facts on " 'dag' colloidal dispersions for use in metal casting," Bulletin No. 425. Address Dept. F-48.

'Aquadag' finds ready acceptance by diecasters for its high temperature resistance, clean parting, and a smoother-surfaced casting.



Bendix finds 'Aquadag' a substantial cost saver. Rejects are down 30% at Bendix Foundries, Teterboro, New Jersey. Where surface folds, internal gas-induced porosity, and other not uncommon factors had previously caused a costly number of rejects in certain critical die-castings, Bendix now enjoys production advantages by using the Acheson water-based dispersion, 'Aquadag'. Used in casting magnesium jet-engine turbine blades and aluminum instrument components, the tough, dry lubricating film provides cleaner parting from the die. This film facilitates proper metal flow. It prevents the molten metal at 1250° F. from soldering to the steel die. It effectively resists the scrubbing action accompanying metal injection, where pressures are often as high as 30,000 psi. Proof of the inherent strength of this film is shown by the fact that one sprayed application normally lasts ten or more casting cycles. Die life is also appreciably extended. 'dag' Colloidal Graphite can play an important part in *your* casting operations . . . a lubricant that is non-volatile, chemically inert, and finely dispersed to provide complete coverage of the die surface.

ACHESON *Colloids Company*

PORT HURON, MICHIGAN

A division of Acheson Industries, Inc.

Also Acheson Industries (Europe) Ltd. and affiliates, London, England

50TH ANNIVERSARY

Offices in: Boston • Chicago • Cleveland • Dayton • Detroit • Los Angeles • Milwaukee New York • Philadelphia • Pittsburgh • Rochester • St. Louis • Toronto

Circle 573 on Page 51

B.F.Goodrich report:

Too hot to handle but it travels on rubber

B.F.Goodrich improvements in rubber brought extra savings

Problem: That fog you see is a cloud of smoke and steam rising from sizzling hot sand on conveyor belt in a foundry. The sand is a scorching 300 degrees—so hot it was ruining belts in a few months.

What was done: When a B.F.Goodrich distributor heard of the problem, he recommended a new conveyor belt called Solarflex. This belt, designed by B.F.Goodrich engineers, is made of a special rubber that stays soft and pliable at temperatures that cause other belts to harden, crack and finally break down.

Savings: The B.F.Goodrich hot-material belt you see here had lasted 30 per cent longer than the previous belt when the picture was taken. It had performed for 9 months—old age for a belt working 16 hours a day, 5 days a week, hauling 60 tons of hot sand an hour.

Extra benefits: Because the B.F.Goodrich Solarflex belt stays flexible even when exposed to high heat, it not only lasts longer than other hot-material belts, but also reduces maintenance costs because it holds fasteners better.

Where to buy: Your B.F.Goodrich distributor has full information on the conveyor belt described here. And, as a factory-trained specialist in rubber products, he *can* answer your questions about *all* the rubber products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Company, Dept. M-316, Akron 18, Ohio.*

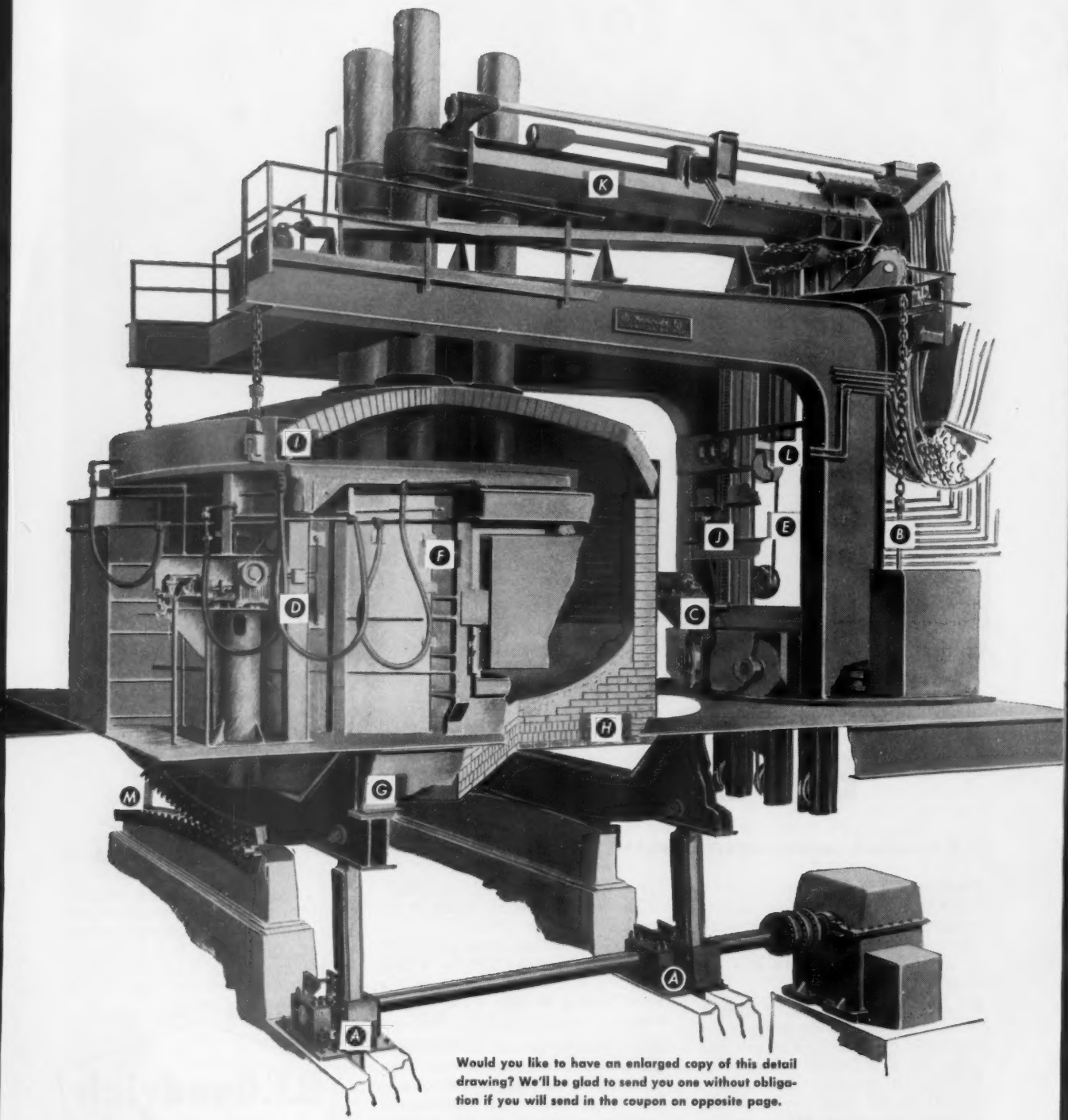
B.F.Goodrich

INDUSTRIAL PRODUCTS

Circle 572 on Page 51

Famous Heroult Furnace redesigned . . .

to help you keep down the cost of



Would you like to have an enlarged copy of this detail drawing? We'll be glad to send you one without obligation if you will send in the coupon on opposite page.

We welcome **an opportunity to help you select and install the Heroult Furnace best suited to your requirements. Remember—*the Heroult we make and install for you will be the finest electric melting furnace that money can buy!***

electric furnace steel

To HELP YOU PRODUCE better quality steel faster and more economically, we have made important design improvements in the long-famous Heroult electric melting furnace. Five of the features shown in the cutaway drawing at the left and described below are to be found *only* in the new Heroult. *All ten* of the illustrated features are important to those interested in the most modern melting equipment. Any way you look at it—performance efficiency, operating economy, or low-cost maintenance—this *new* Heroult is unquestionably the *finest* electric melting furnace on the market.

1. The Heroult Furnace is *the only* 100% *mechanically operated electric furnace.*

It includes such mechanical features as: (A) heavy rack-and-pinion-type tilting mechanism, (B) mechanical roof lift, (C) motor-driven, rotating, jib-type roof swing, (D) winch-operated, water-cooled, jib-type door-lifting mechanism, and (E) high-speed, electro-mechanical electrode-positioning mechanism.

2. *Another exclusive* — Cage-type shell construction with shell plates loosely attached (F) to a heavy supporting structure.

This construction minimizes shell warping and allows easy replacement of damaged shell plates.

3. *Exclusive*—Operating mechanism independently supported.

The tilting platform on which all operating mechanisms are supported is attached directly to the rockers independent of the shell structure (G). Thus operating mechanisms are unaffected by any shell distortion.

4. *Exclusive*—Flat Bottom Shell.

This feature (H) facilitates easy shell relining and provides maximum protection against burnouts. Thicker refractory at the sides of the hearth promotes more uniform bath temperature.

5. *Exclusive* — Water-cooled, Skew Back Roof Ring.

This feature (I) eliminates the need for special skew-shaped roof refractories.

6. Electrode Mast Safety Device.

This spring-loaded, rack-and-pawl-type device (J) provides positive protection against damage resulting from electrode winch cable breakage.

7. Square-Section, Water-Cooled Electrode Mast Arms.

This design (K) guarantees a rigid connection between mast and mast arm, thus helping to maintain proper electrode position.

8. Remote-Controlled Electrode Clamps.

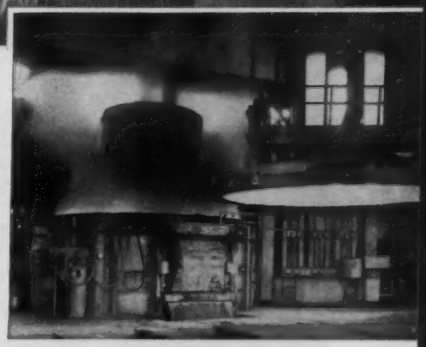
This device, of the spring-clamp, air-release type, is located inside of the rear section of the water-cooled mast arm where heat cannot affect it.

9. Square-Sectioned Electrode Mast.

This design feature (L), developed by American Bridge, assures proper guiding and electrode positioning.

10. Rockers.

The heavy fabricated steel curved top and bottom rockers (M) minimize forward travel during tilting. These rockers are so designed that the furnace will tend to return to horizontal position from any degree of tilt.



THE NEW

Heroult

ELECTRIC FURNACES

are available in:

—sizes of shell diameter ranging from 7′ 0″ up, and with capacities of from 6,000 lbs. up to 400,000 lbs. and greater. They are equipped with roof-removing mechanism to permit fast top charging. They can readily be furnished with a non-magnetic shell bottom section to accommodate induction-stirring equipment.

Gantry-type top-charge furnaces, door-charge furnaces, and special furnaces for duplexing and non-ferrous melting can also be supplied.

Heroult

ELECTRIC MELTING FURNACES

Send coupon for catalog and/or enlarged copy of detail drawing with special installation and engineering data.

American Bridge Division
525 William Penn Place, Dept. FO-48
Pittsburgh 30, Pa.

Please send me a copy of the latest Heroult Electric Furnace catalog ( ) and/or your new folder showing large drawing with special installation and engineering data ( ).

Name ..... **Title**.....

Firm Name .....

Address .....

City ..... **State**.....

American Bridge
Division of USS United States Steel

Contracting Offices in New York, Philadelphia, Chicago, San Francisco, and other principal cities. United States Steel Export Company, New York

Circle 574 on Page 51

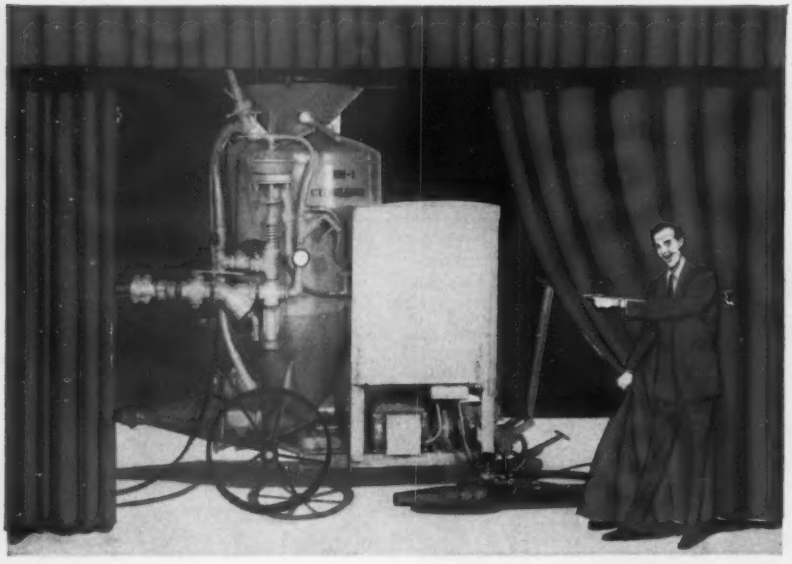
(Advertisement)

International Minerals & Chemicals

A REPORT TO FOUNDRIES

A SNEAK PREVIEW

Regardless of what you think after studying the illustration, this is not a Sputnik launcher. It is a foundry refractory gun. It just goes to show what happens when we write a memo to the air-placement engineering group as follows:



"Since we introduced the refractory gun principle to the foundry industry nine years ago, we have sold, serviced, and operated over 700 Bondactors and Cupolinors. We think we know what the foundryman wants; now all you have to do is build it.

"It must be a *one man* machine. We don't mean that he just starts and stops it by himself. We mean that the man in the cupola must be able to control the rate of feed, the pressure, the moisture, and every phase of the operation with no outside help. It must be as fast as the fastest Cupolinor or as slow as the slowest competitive machine or anything in between, depending on what the customer wants. It must have a smoother flow than any machine ever built for the purpose.

"It must be designed to be built in a wide range of sizes, probably as small as 1000 pound capacity and maybe as large as 6000 pound capacity (or even bigger). It should be such that the foundryman can hook it directly to his permanent patching material-hopper, if he wishes to eliminate all manpower in filling and handling the materials except for the one individual in the cupola. It must be cheap enough to be able to pay for itself easily and quickly out of the savings in labor alone (as compared with the two-man machine). And it must be ready to show in Cleveland in May of 1958."

To make a long story short, they did it. We got it. The first one of our men to operate this machine in the field came back with such enthusiasm that the entire engineering staff de-

WHAT DOES YOUR CUSTOMER WANT?

One of the subjects discussed last year at a New England Foundry Convention was a survey made by the gray iron foundry society which got replies from more than 700 purchasing agents and 1500 design engineers. This survey indicated that of the foundry customers (your customers), 66% were interested primarily in quality, only 18% in price, and 16% in delivery or service. They want the best price only after the survey clearly showed that they are assured of quality.

The development of such things as the Taccone Molding Machine, Plasti-Bond sand additives, and Dixie Bond and other products is directly related to the desire to improve the quality of castings.

In addition to using such things as Plasti-Bond to improve quality to appeal to at least 66% of the market, some foundrymen have also featured these products in their own advertising and selling campaigns. A number of the Taccone foundries, for example, are advertising and selling the fact that the Taccone Machine and Plasti-Bond assure their customers a better product. Your customer is interested in the fact that you are doing something definite about maintaining your quality. If you are interested in reaching that 66% of the market which wants a better casting, we will be happy to show you what our "special" products can do to make your selling easier.

manded an increase in salaries. After discounting half of what he said on general principles, it still looks like we may have what our customers have been requesting for over five years. We will continue to field test it between now and convention time and then we will be very much interested in your reactions when you see it in our booth at the show.

TECHNICAL SERVICE

NORMAN J. DUNBECK
Vice President

You who know Norman J. Dunbeck, as so many of you do, will not be surprised when we introduce him, our Vice President, as a member of our Technical Service Staff. For, you see, it is Norm Dunbeck's philosophy of wanting to provide sound technical service to the foundry industry that has inspired the entire Eastern Clay organization.

Norman Dunbeck's interest in technical service stems from nearly 40 years of foundry work. Two years after graduating from college with a B.S. Degree in Chemical Engineering, he joined Eastern Clay. He became Plant Superintendent in 1927 and Vice President in 1936. When IMC acquired Eastern Clay in 1951, he became Vice President of the parent organization.

Mr. Dunbeck is one of the foundry's outstanding personalities . . . author, lecturer, and pioneer in the development of many basic improvements in foundry sand practice. He is a member of A.F.S., A.C.S. and A.I.M.E. and has contributed generously of his time and effort to activities of the Societies.

He has worked on problems of synthetic sands and binders since 1923 and also directed the research and successful adaptation to foundry practice of Southern bentonite, chemically coated sands and air placement of cupola refractories.

Norman Dunbeck's leadership is reflected in the technical competence and spirit of helpfulness of the Eastern Clay representative who serves you in your foundry.

SUPER HOT STRENGTH AND DRY STRENGTH

When we first brought out Balanced Revivo many years ago, someone said, "Oh, you finally admit that Revivo isn't balanced." We explained quickly that Balanced Revivo is not one clay but a special blend of five ingredients. In combination with other clays, it can give you: (1) high green strength with very high dry strength, (2) very high green strength with high dry strength, (3) very high green strength with moderate dry strength, (4) very high green strength with low dry strength, (5) moderate green strength with very high dry strength, (6) moderate green strength with moderate dry strength.

This is impossible, of course, if we are talking about one material. Actually, the proper combination of Balanced Revivo with Revivo or Dixie, or Black Hills bentonite gives almost any properties you want. The primary function of Balanced Revivo is to provide hot strength properties. Its green strength is adequate. Its dry strength and hot strength are maximum. Alone, it is a complete and adequate binder for heavy work or for dry sand molding.

Although Balanced Revivo is particularly designed for skin dried or dry sand work and to stop washing and scabbing in green sand molding, it is also widely used as an additive for naturally bonded sands such as Albany in producing brass and bronze castings. We would not normally think of bronze as requiring a high hot strength but the characteristics of Balanced Revivo seem to be the perfect augment for the natural sand used in the non-ferrous industry!

Balanced Revivo is not a cheap binder since it is sold in the range of $50.00 per ton. However, it is widely used by foundries to produce green sand and skin dried work from the same sand. It is excellent for large dry sand work as it combines both high green strength and high dry strength with the ability to skin dry or bake. Many foundries use it to produce loam castings, swept molds, skin dried molds, and green sand molds all with the same base sand, using Balanced Revivo as a principal bond. A brochure on Balanced Revivo would help you decide if it is of interest to you. Or better yet, talk with us. IMC is in the unique position of producing all available types of sand binders or bonding materials so we are completely impartial when recommending the best sand practice.

International Minerals & Chemicals

EASTERN CLAY PRODUCTS DEPT.
INTERNATIONAL MINERALS & CHEMICAL CORPORATION
20 NORTH WACKER DRIVE, CHICAGO 6 • PHONE: Financial 6-1800

Circle 575 on Page 51

Maintains Profits Through Foundry Modernization . . .

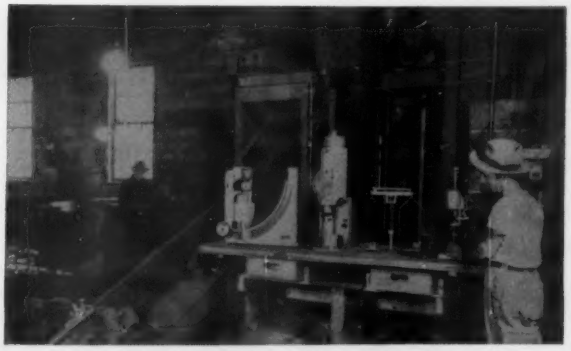
"We take pride in our modern equipped foundry and maintain a profit through its efficient operation," states Mr. G. F. Langford, President of Superior Kendrick Bearings, Inc., Detroit, Michigan.

To be able to do this has meant sound planning and the employment of dependable sand handling and conditioning equipment. When it was decided to spend a considerable amount of dollars to modernize this foundry Newaygo was commissioned because of their straightforward approach to the job — realistic bidding, sound engineering, sturdy, well built equipment and dependable delivery.

In this foundry, and many others with Newaygo installations, experience shows that profits keep up with progressive mechanization. Newaygo is geared to handle large and small sand handling jobs — complete systems or component parts. Newaygo foundry-designed equipment means increased production through greater capacity and lower costs through operating efficiencies.

Molds are conveyed from the roller conveyor set-out and pouring floor to traveling shakeout cars mounted directly over a vibrating pan-type conveyor which carries sand and castings to one end of the foundry. Here, the sand is separated through a grid section in the vibrating pan and passes up a shakeout belt with an automatic water addition device and onto the processing equipment. Castings continue over the end of the vibrating conveyor where they discharge into tote boxes next to the cleaning room.

Above is a section of the Newaygo overhead sand distribution system at Superior Kendrick Bearings, etc. This particular mechanized installation serves six molders with a distribution belt conveyor feeding sand into overhead molding hoppers. Adjacent to molding stations are gravity conveyor mold set-outs and flask return lines. According to Mr. P. O. Jellby, Chief Engineer at the foundry, this equipment has helped gain a 30% increase in production, a 50% decrease in labor fatigue, and a 75% decrease in sand shoveling.

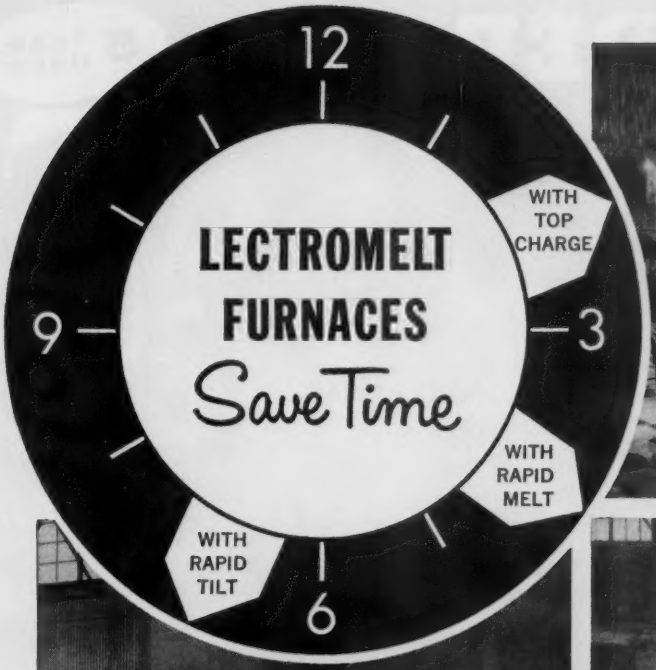


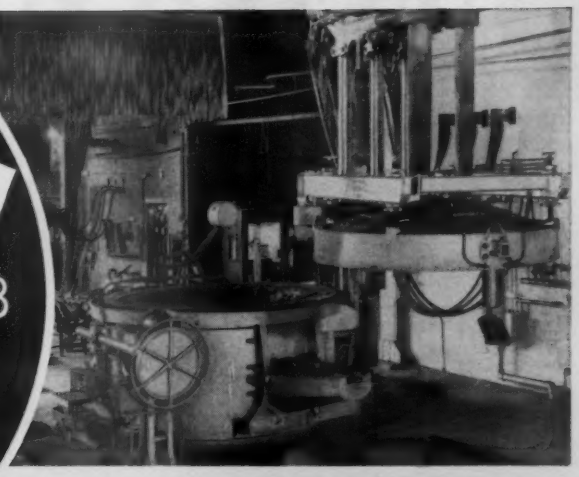
Correct planning and installation has also located the sand testing equipment adjacent to the sand conditioning units. Foundry sand tests are made frequently and in a minimum of time. Attention to this important function has meant more perfect castings and fewer rejects.

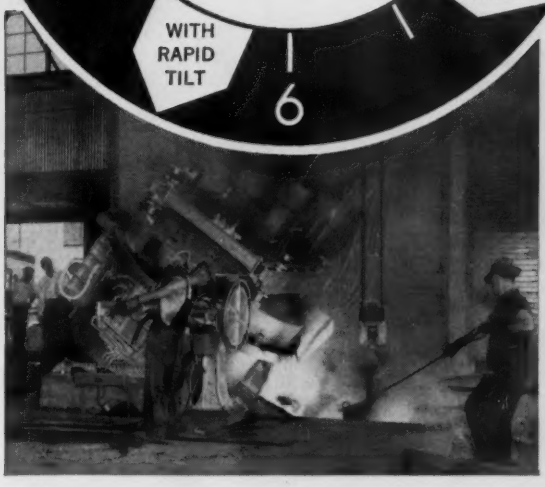
Call in your Newaygo representative regarding mold handling, sand handling and conditioning equipment. He'll show you how it can pay off in your foundry.

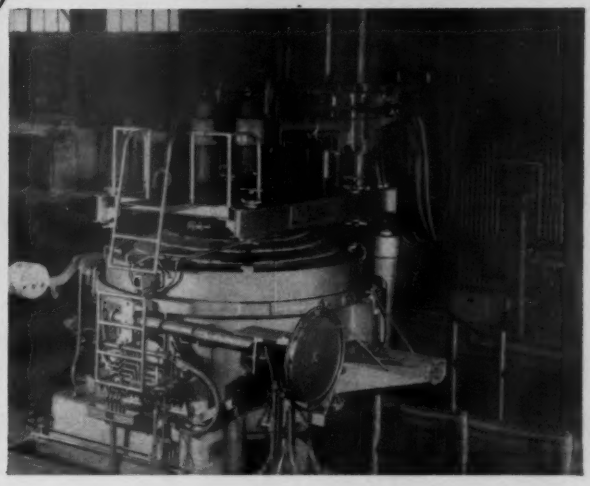
NEWAYGO *engineering company*

NEWAYGO, MICHIGAN









When you melt... LECTROMELT*

TOP CHARGING provides smooth, fast turn-around in furnace operation —less downtime between heats and less heat loss. Linings and electrodes last longer.

HIGH POWER INPUT allows rapid metal melting. Lectromelt makes this possible with large transformers and leads, more efficient cooling and heavier furnace construction.

RAPID TILTING is accomplished smoothly and safely. Mechanism is accurate, strong and side-mounted—located out from under, where it won't get clogged by spillage.

Catalog 10 describes Lectromelt Furnaces. For a copy, write Lectromelt Furnace Division, McGraw-Edison Company, 314 32nd Street, Pittsburgh 30, Pennsylvania.

*Reg. Trademark U.S. Pat. Off.

McGRAW EDISON

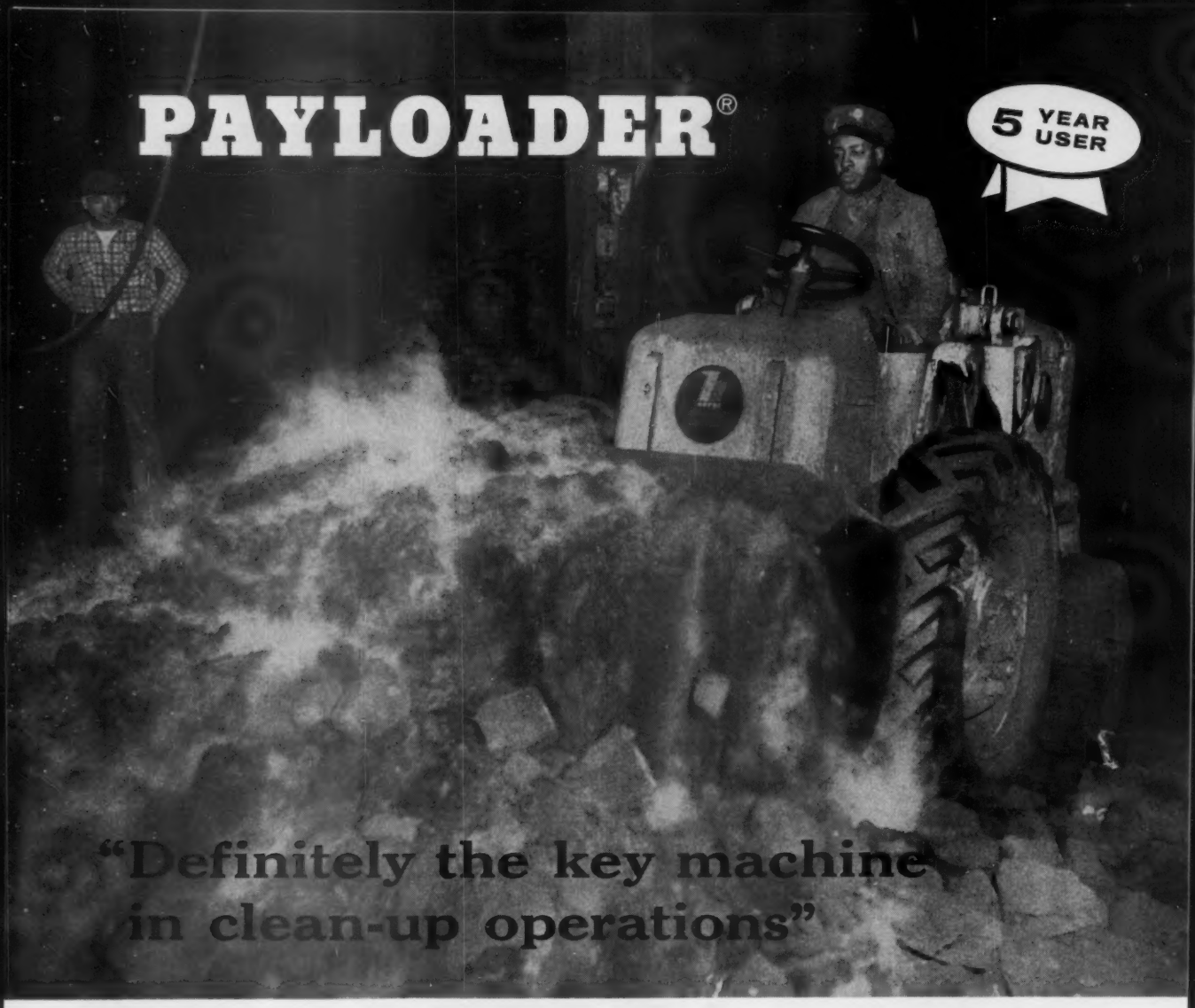
Lectromelt

CANADA: Canefco Limited, Toronto . . . ARGENTINA: Master Argentina, Buenos Aires . . . ITALY: Forni Stein, Genova . . . ENGLAND: Electric Furnace Co., Ltd., Weybridge . . . GERMANY: Demag-Elektrometallurgie, GmbH, Duisburg . . . SPAIN: General Electrica Espanola, Bilbao . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Stein & Roubaix, Bressoux-Liege . . . JAPAN: Daido Steel Company, Ltd., Nagoya

Circle 577 on Page 51

PAYLOADER®

5 YEAR USER



"Definitely the key machine in clean-up operations"

Dewey Bros., Inc. at Goldsboro has been in business for 73 years and is the second largest foundry in North Carolina. It now uses two model HA "PAYLOADER" tractor-shovels and a larger model HAH to handle about 275 Tons of sand three times daily.

John H. Daniels, Dewey Bros.' equipment superintendent, referring to this model HAH "PAYLOADER" says, "it has been the most trouble-free machine ever used on the job . . . has had less than 35 hours lost time in nearly 3 years of continuous service. I want to say also that the "PAYLOADER" Distributor offers the best service of any of our suppliers."

Edgar Knowles, asst. night foreman, also adds, "Our HAH is definitely the key machine in the clean-up operation. It is fast, maneuverable and dependable. The roll-back bucket carries a heaped load without spillage."

Whatever size or sizes of tractor-shovels you need in your operations, you can be sure, like Dewey Bros., Inc. of getting top production and dependable performance if you choose a proven "PAYLOADER", plus unmatched service from the Hough Distributor that sells them. It will pay to have him show you what a "PAYLOADER" can do. Ask him about Hough Purchase and Lease Plans too.

THE FRANK G. HOUGH CO.
703 Sunnyside Ave., Libertyville, Ill.

Please send "PAYLOADER" information:

- ☐ Model HA (2,000 lbs. carry cap.)
- ☐ Model HAH (3,000 lbs. carry cap.)
- ☐ Attachments for scrap handling

Name _____

Title _____

Company _____

Street _____

City _____ State _____

4-A-2

SAY "HUFF"

Modern Materials Handling Equipment

THE FRANK G. HOUGH CO.

LIBERTYVILLE, ILLINOIS

SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

Circle 578 on Page 51

Late News

SCRAP RESOURCES: The total future supply of ferrous scrap will be adequate, but withdrawals of heavy melting grades from the scrap reservoir may exceed additions during the next decade. These are the conclusions of a Business and Defense Services Administration report prepared by Battelle Memorial Institute, Columbus, Ohio, to supplement the report made to Congress a year ago by the Department of Commerce. The reappraisal states that although the current slowdown in the economy has eased the situation to some extent, the original conclusion still is valid. Indications exist, however, that certain technological and economic factors may affect the scrap situation basically and require a reassessment of many assumptions made in the current studies.

STEEL FOUNDERS ELECT: Ross L. Gilmore, president, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., was elected president of Steel Founders' Society of America at its recent annual meeting. Other officers chosen are B. P. Hammond, Blaw-Knox Co., Pittsburgh, vice president, and R. G. Parks, National Malleable & Steel Castings Co., Cleveland, treasurer.

CAR BUYING LAGS: Freight car builders are subsisting largely on backlogs, but unfilled orders are shrinking fast. February deliveries of new cars totaled 5316, while orders amounted to 294. A year ago deliveries were 8184, against orders for 6065 cars. Backlogs on March 1 of 43,750 units compare with 111,965 a year ago.

NEW INSTITUTE: The Cast Bronze Bearing Institute was formed March 6 by producers of finished-machined cast bronze bearings. It will promote use of cast bronze bearings and bushings through research, development, education, and promotion. The institute is affiliated with the Non-Ferrous Founders' Society as a division, with headquarters at 1604 Chicago Ave., Evanston, Ill., and Herbert F. Scobie serving as executive secretary of both groups. Other officers are G. Frank Langford, Superior Kendrick Bearings Inc., Detroit, president; W. H. Crossman, Randall Graphite Bearings Inc., Lima, Ohio, vice president, and Carter N. Paden, Moccasin Bushings Co., Chattanooga, Tenn., secretary-treasurer.

DIE CASTING TREND: Percentage of all aluminum die castings produced by captive foundries during the last 5 years averaged 28 per cent, almost double that of the preceding 5 years. An important reason for this trend, a Congressional committee was told recently, has been the growing practice of the automotive industry, which consumes almost 45 per cent of total output, to buy molten metal from aluminum producers. Testifying at Washington, David Laine, executive secretary, American Die Casting Institute, said the jobbing diecaster pays up to one-third more for metal than does the captive foundry situated next door to the aluminum potlines. This situation, he said, has put the job shop at a serious competitive disadvantage and he urged enactment of legislation to end the alleged price discrimination.

OBITUARY: Cal C. Chambers, 69, president and general manager, Texas Foundries Inc., Lufkin, Tex., died March 16 . . . John J. Boland Sr., 71, retired superintendent of several Griffin Wheel Co. foundries, died March 14 . . . Alexander S. Wright, New England sales representative, Springfield Facing Inc., Willimansett, Mass., died March 2 . . . Dan W. Leedy, foundry manager, Dalton Foundries Inc., Warsaw, Ind., died Feb. 14 . . . Alfred E. Porter, 56, vice president and general manager, Howard Foundry Co., Alloy Steel & Iron Casting Div., Chicago, died March 15.

PERSONALS: E. A. Lindemann, former president, A. J. Lindemann & Hoverson Co., has been elected first vice president, Ampco Metal Inc., both of Milwaukee . . . Roy Booth

has been appointed custom castings sales representative, J. B. Ehrsam & Sons Mfg. Co., Enterprise, Kans. . . . Jack Fitzgerald has been named foundry sales representative, Frederic B. Stevens Inc., with headquarters at Milwaukee . . . Thomas E. Sheehan has been made factory sales representative, Permanent Mold Die Co., Hazel Park, Mich. . . . Frank P. Veach has joined Pekay Machine & Engineering Co. as sales representative in the Chicago area.

EXPANSION: Turbo-Cast Inc., investment casting foundry with plant formerly at Van Nuys, Calif., is moving to a new 100,000-sq-ft plant it has bought at 1922 E. Gage Ave., Los Angeles. The new quarters will provide a large increase in capacity.

DELPORT HONORED: Vincent Delport, European manager, *Foundry*, has been awarded the Meritorious Services Medal of the Institute of British Foundrymen "for the great work he has done for the IBF . . . over many years."

INDUSTRIAL FURNACES: February orders for industrial furnaces totaled $3,684,000, an increase of 21 per cent over January volume but 56 per cent less than a year ago, according to the Industrial Heating Equipment Association. Business for the first two months this year was off 57 per cent from the 1957 period.

MISCELLANY: Primary aluminum production in February totaled 121,602 tons, compared with 119,059 tons a year ago . . . General Electric Co. has reduced prices 2 cents a pound on its silicone emulsion release agent for shell molding . . . January index of material handling equipment orders was 93.07, compared with an average of 124.3 for all of 1957, the Material Handling Institute reports . . . Cleveland Crane & Engineering Co., Wickliffe, Ohio, has broken ground for an 11,400-sq-ft research and development building . . . Wilmington Casting Co., Wilmington, Ohio, has bought a controlling interest in the Atchison Specialty Mfg. Co., Atchison, Kans., manufacturer of iron and brass plumbing supplies . . . American Brake Shoe Co., New York, has closed its brake shoe foundry in Toledo, Ohio. Company officials say that the volume of brake shoes required by railroads served by the plant has been declining steadily . . . Capital Brass & Aluminum Foundry Co., Chicago, has purchased Smeeth-Harwood Co., Chicago nonferrous foundry, and will operate it as a division.

Prices of Foundry Metals and Coke

(As of March 24, 1958)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$18.00-18.50
OVEN	
Birmingham	$28.85
Buffalo	30.50
Detroit	30.50
Erie, Pa.	30.50
Indianapolis	29.75
Kearny, N. J.	29.75
Milwaukee	30.50
Montreal, Que.	31.00
Neville Island (Pittsburgh)	29.25
New England, deld.	31.55
Painesville, O.	30.50
Philadelphia	29.50
St. Louis	31.50
St. Paul	29.75
Swedeland, Pa.	29.50
Terre Haute, Ind.	29.75

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Buffalo	66.50	67.00
Chester, Pa.	67.00	67.50
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 24.75; tin bronze, No. 225, 33.50; No. 245, 28.25; High-leaded tin bronze, No. 305, 28.75; No. 1 yellow, No. 405, 20.25; manganese bronze, No. 421, 22.50.

ALUMINUM: 99 per cent plus primary ingots 28.10. Secondary No. 12 alloy, 21.00-21.25. Deoxidizing grades: No. 1, 23.00; No. 4, 18.00.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 25.00, delivered Connecticut valley.

ZINC: High grade 11.35 delivered. Die casting alloy No. 3, 14.25; No. 2, 15.25, delivered.

IRON AND STEEL SCRAP

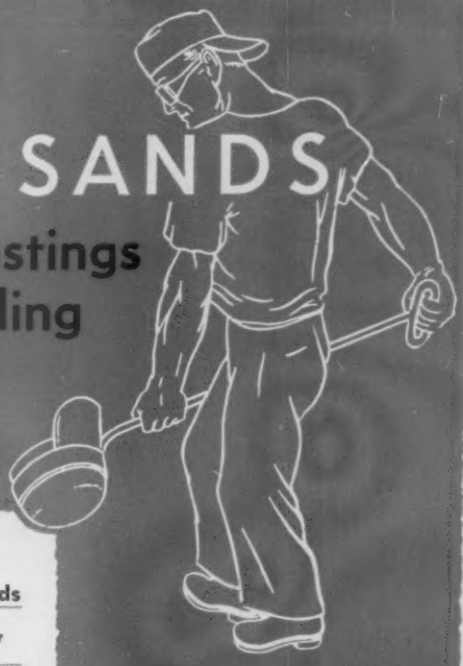
(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$33.00-34.00	$51.00-52.00	.....	.....	.....	.....	$49.00-50.00
Boston*	**30.00	**29.00-30.00	.....	.....	**35.00-36.00	.....	.....
Buffalo	28.00-29.00	**42.00-43.00	.....	.....	**47.00-48.00	.....	53.00-54.00
Chicago	34.00-35.00	41.00-42.00	.....	48.00-49.00	48.00-49.00	53.00-54.00	54.00-56.00
Cincinnati*	**32.00-33.00	**39.00-40.00	**33.00-34.00	.....	**47.00-48.00	.....	**54.00-55.00
Cleveland	33.00-34.00	44.00-45.00	36.00-37.00	45.00-46.00	48.00-49.00	60.00-61.00	57.00-59.00
Detroit*	**28.00-29.00	**37.00-38.00	**31.00-32.00	**39.00-40.00	.....	.....	.....
Los Angles	32.00	**38.00	.....	.....	.....	.....	.....
New York*	33.00-34.00	35.00-36.00	34.00-35.00	.....	.....	.....	.....
Philadelphia	38.50	40.00	44.00	.....	50.00	62.00	59.00-60.00
Pittsburgh	36.00-37.00	40.00-41.00	.....	42.00-43.00	49.00-50.00	.....	55.00-57.00
St. Louis*	33.00	45.00	33.00	45.00	.....	.....	56.00
San Francisco	32.00	40.00	28.00	40.00	40.00	.....	.....
Seattle	30.00	31.00	28.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

Whitehead's FINE SILICA SANDS

for Fine Finish Castings and Shell Molding



Whitehead offers the widest variety of fine washed and unwashed silica sands . . . all laboratory-tested in a Whitehead laboratory in each of the areas represented.

DIVIDING CREEK, New Jersey

Fine Washed Silica Sands

Retained on Sieve #	Grade D #71	Grade D Special #75	Grade E #96	Grade Overflow #118	Grade Superior #158
30	none	none	none	none	none
40	2.0	1.0	1.0	.2	.2
50	9.8	4.8	7.6	3.2	1.8
70	26.4	14.0	20.4	13.2	4.6
100	41.0	40.2	31.8	29.0	11.2
140	15.0	29.8	17.2	20.2	22.4
200	4.4	8.2	10.8	15.4	25.6
270	.8	1.2	5.6	8.8	14.0
Pan	.6	.8	5.6	10.0	20.2

McCONNELLSVILLE, New York

Fine Unwashed Silica Sands

Retained on Sieve #	#103	#130	#155	#180	#230	#275
30	.3	.2	none	none	none	none
40	.5	.2	.4	"	"	"
50	4.2	.4	1.4	"	.2	"
70	13.6	1.6	3.2	.4	.2	.2
100	26.1	12.4	10.2	2.5	.4	.6
140	25.7	32.8	22.0	18.0	4.0	1.2
200	20.8	37.2	30.0	35.9	21.4	6.4
270	5.5	9.8	14.2	17.4	21.4	11.2
Pan	3.3	5.4	16.8	23.8	46.4	80.4
Very Fine	none	none	1.8	2.0	6.0	

NEW ENGLAND

Marion Fine Washed Silica Sand AFSF #105

Sieve #	Retained
+6	none
12	"
20	"
30	"
40	.6
50	1.4
70	6.0
100	30.6
140	34.4
200	19.2
270	4.6
Pan	3.2

LEADER IN FOUNDRY SANDS SINCE 1841

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
17 Exchange Place, Providence 1, R. I.

Manufacturers of:

LYQUAGRIP
Ready-to-use core paste

DOB-IT
Ready-to-use core mudding compound

JOINT-SEAL
Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

Circle 579 on Page 51

One of a series on: **why practical foundrymen select**

Henry Furnace Company,
Medina, Ohio
uses 50% less bonding material since installing 2F Mix-Muller.

American Abrasives Metal Co.,
Irvington, N. J.,
saved $2500 in bond alone during first year operating their 2F Mix-Muller.

Studebaker-Packard Corp.
Manifold line
—Sand output tripled: sand quality improved . . . moisture control improved . . . since installation of 2½F Mix-Muller. Is one of 13 Mix-Mullers used at South Bend, Ind. Foundry.

"Use of bond in system has been cut by 50% with no loss in quality."
Superior Foundry Company
Cleveland, Ohio

". . . our mulling cycle has been cut by 30% due to increased capacity and reduced mulling time. Facing has been eliminated."
Xenia Foundry & Machine Co.
Xenia, Ohio

"Mixer has paid for itself in savings of costly materials . . . and principally in the fact that our results are now more consistently uniform."
Pioneer Foundry,
Houston, Texas

". . . also reduced binder by 50%."
Grey Iron Foundry
Kansas

How Simpson mulling principle can save you up to 50% in bond cost

When a batch of sand and bond is mulled the sand will achieve *most* of its green strength early in the process . . . But, *most* isn't always good enough to do all jobs. Scrap, inferior castings, wasted time, money and material are poor reward for a half mulled batch of foundry sand—when the total savings in mulling time may be less than a minute.

There is another way to save mulling time . . . *use a great deal more bond*. You'll get your strength but it will still be earned at the expense of questionable sand quality . . . and bond is costly.

Some foundrymen make a choice—time or bond, but many more *get both* by doing one of two things:

(1) Changing to Simpson Mix-Muller

(2) Using their present Mix-Muller wisely

These *practical* foundrymen know from experience, that they may mull a batch a little longer in a Simpson but they also know that, model for model, the Mix-Muller can turn out more, better sand in a given time than any other sand mixer!

Simpson MIX-MULLER by four to one

Yes, you can save on bond with the Mix-Muller

. . . up to 50% as reported by users—but you'll save in six other ways too. Combined, these savings mean much more to practical foundrymen than a few seconds saved in mulling. They are the reason why, for almost 50 years, Simpson Mix-Muller has been the choice of *practical* foundrymen by four to one over any other means of sand preparation.

ANOTHER!
PROVEN PRODUCT OF THE PRACTICAL FOUNDRYMAN BY NATIONAL

SIX WAYS YOU SAVE WITH MIX-MULLER

GET MORE FOR YOUR EQUIPMENT DOLLAR WITH MIX-MULLER

Model for model, you'll mix more sand—get more tonnage per hour with large capacity Mix-Muller.

SAVE RAW MATERIALS WITH MIX-MULLER

Only *true* mulling permits you to use lean mixtures. You'll make the most of *less* oil, binder and other additives—and get top quality sand at the same time.

YOU SAVE SCRAP WITH MIX-MULLER

True mulled sand cuts down on casting, mold and core scrap.

YOU SAVE CLEANING COSTS WITH MIX-MULLER

Uniformly coated sand means better finish—right from the mold with less cleaning time.

YOU SAVE POWER WITH MIX-MULLER

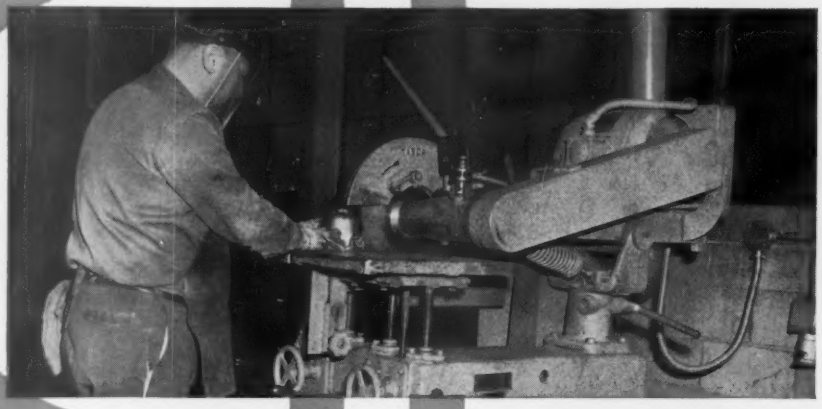
Mix-Muller takes only about ½ the power of other machines —to do the same or a better job. Only power required is used to plow and to roll mullers over the sand.

YOU SAVE MAINTENANCE WITH MIX-MULLER

Simple, rugged construction makes Mix-Muller easy to operate, maintain—and get parts for. Low speed mulling insures longer wear and part life to save you materials and man hours.

National Engineering Company, 646 Machinery Hall Bldg., Chicago 6, Ill.

Circle 580 on Page 51



Fall River Foundry, Fall River, Wisconsin, uses Tabor-Brasive Cut-Off, Model B-7½-AC, for clean, fast cuts on nickel, bronze, and brass gates.

Saves up to $400 per month with TABOR CUT-OFF

A new Tabor-Brasive Cut-Off Machine at Fall River Foundry, Fall River, Wis., paid for itself in five months, according to Harold E. Younger, Plant Manager. The Fall River Foundry, a subsidiary of Badger Meter Company, Milwaukee, cuts nickel, bronze, and 85-5-5-5 brass. The Tabor Cut-Off has saved up to $400 per month in band saw blades.

"In cutting 20% nickel gates, we formerly used $50-worth of saw blades per day," Mr. Younger says. "Now we are saving this cost and getting fast, clean cuts with the Tabor Cut-Off."

Tabor Brasive Cut-Offs are tough, precise, production machines. Reduce cutting time more than 50% when compared with sawing or chipping operations. Units range from 5 hp to 20 hp. Bulletin 575 gives full details — write for your copy today.

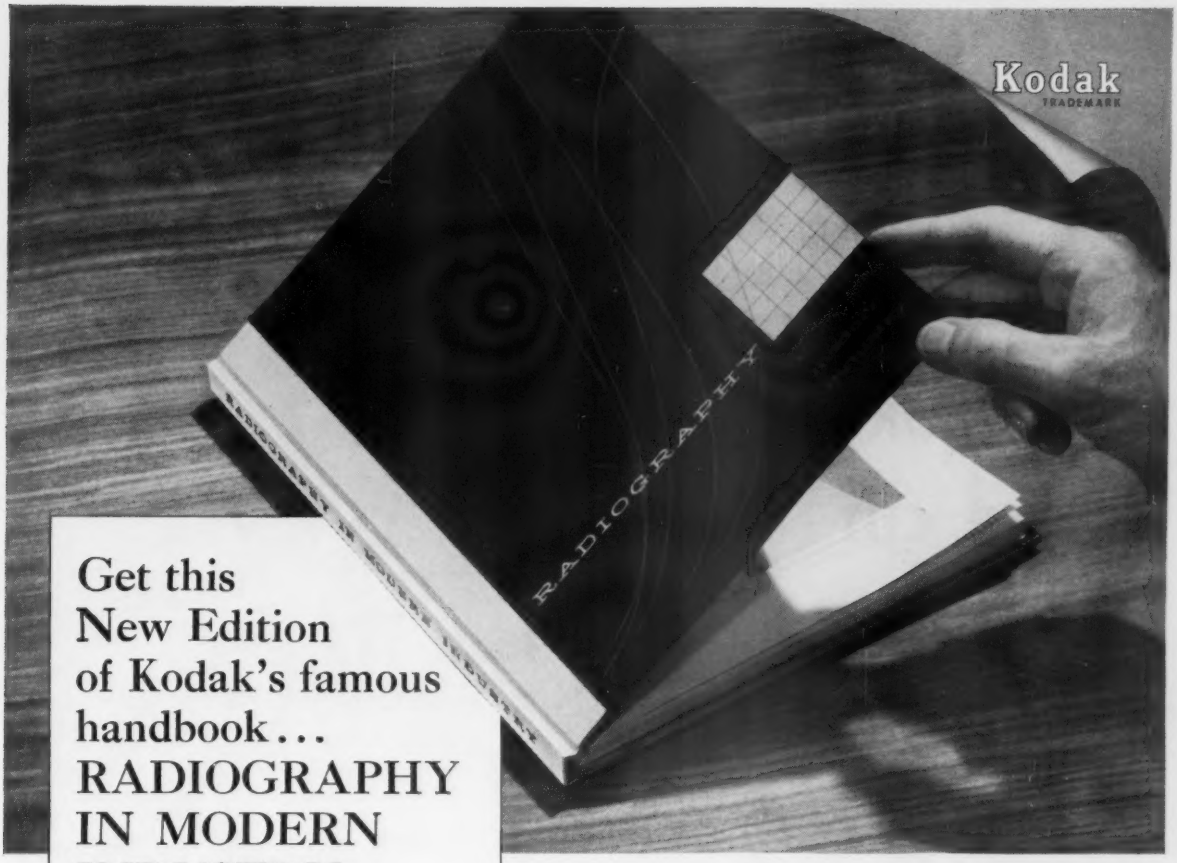
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

TABOR

THE TABOR MANUFACTURING CO.

Division of Turbo Machine Co.

LANSDALE, PA. TELEPHONE: ULYSSES 5-5131



Get this New Edition of Kodak's famous handbook... RADIOGRAPHY IN MODERN INDUSTRY

An authoritative, up-to-the-minute text which explains the fundamentals of x-rays and gamma rays, and their use in radiography for industry.

Everyone interested in industrial radiography should have the latest edition of this famous handbook. It contains all the information found in the previous text, plus up-to-the-minute additions. It tells about new technics, new sources of radiation, and new fast films; explains proper methods of using them.

No one engaged in radiography should be without this latest edition of *Radiography in Modern Industry*. Get it from your Kodak x-ray dealer, or send coupon below.

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- size 8½ x 11 inches
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- 15 chapters
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X-ray Division, Rochester 4, N. Y.

Gentlemen: Enclosed is $5.00. Please send me "Radiography in Modern Industry." 50-4

Name _____

Address _____

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State _____

Circle 582 on Page 51

HOTTER CUT
LESS SMOKE
HOTTER CUT
LESS SMOKE
HOTTER CUT
LESS SMOKE
HOTTER CUT
LESS SMOKE
HOTTER CUT
LESS SMOKE
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HOTTER CUT
LESS SMOKE

In their iron-powder metal cutting production,
here's two good reasons why
H. P. DEUSCHER CO. changed to
HOEGANAES
ANCOR-FLAME

...and also saved 38% of former iron powder costs

That really adds up to three good reasons. Hotter cut—less smoke—and a saving in iron powder costs of 38%.

Little wonder that Mr. Paul Weber, Maintenance Foreman of H. P. Deuscher Co., Hamilton, Ohio, changed to Hoeganaes Ancor-Flame . . . the result of a routine materials test in the production of their gray iron castings.

Ancor-Flame Iron Powder, when introduced into the oxygen stream, oxidizes rapidly—increases flame temperature. Easily permits flame cuts of stainless steels and oxidation-resistant metals. And, as in this outstanding case, *in gray iron castings, too.*

Write for the Hoeganaes literature on Ancor-Flame that tells all you want to know about the advantages of powder cutting. Better still, write for the services of the Hoeganaes Engineering Specialist . . . *he'll explain the advantages and savings in detail.*

HSIC

HOEGANAES

HOEGANAES SPONGE IRON CORPORATION
RIVERTON, NEW JERSEY

SALES REPRESENTATIVES IN PRINCIPAL CITIES: Birmingham, Chicago, Cincinnati, Cleveland (Fostoria), Edmonton (Alberta, Canada), Los Angeles, Minneapolis, New England (Elmira, N.Y.), Philadelphia (Riverton, N. J.), Pittsburgh, San Francisco, St. Louis

Circle 583 on Page 51
Circle 584 on Page 51→

WRIGHT HOISTS & CRANES

ACCO

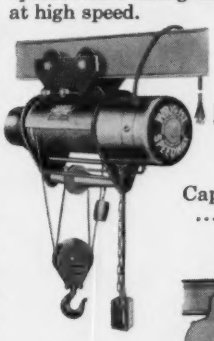
FOR LONGER LIFE • EASIER MAINTENANCE
LOWEST FINAL COST

WRIGHT *SPEEDWAYS*

Available with single, 2-speed or variable speeds and with a wide variety of mounting arrangements

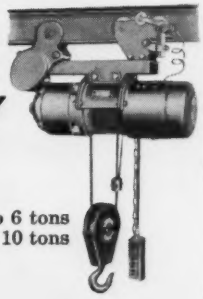
2-SPEED *SPEEDWAY* FRAME 1

Capacity ¼-ton to 1 ton. Two-speed, 1800/450 RPM motors permit precise, gentle positioning of work at slow speed... fast lifting and lowering at high speed.



***SPEEDWAY* FRAME 1½**

4-part reeved. Capacity to 2 tons ...relatively slow lifting speeds.



***SPEEDWAY* FRAME 2 FRAME 3**

Capacities—
Frame 2, ½-ton to 6 tons
Frame 3, 4 tons to 10 tons

NEW WRIGHT ELECTRIC CHAIN HOISTS

LIGHT—COMPACT—RUGGED—LOW COST

SINGLE CHAIN

DOUBLE CHAIN

Two capacity ranges as pictured. Single Chain—300 to 2000 lbs. Double Chain—3000 to 4000 lbs.

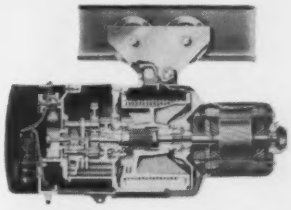
Long Life—Safety—Minimum Maintenance are assured by—

Alloy Steel Load Chain wick-oiled for longest life...heat-treated for long-wearing surface and ductile shock-resistant core—**Load Wheel, Hooks** and **Hook Couplings** drop-forged alloy steel—**Precision Ball Bearings** and **Gears** operate in oil bath—**Double Braking**—**Fewest Moving Parts.**

These Features make WRIGHT *SPEEDWAYS*

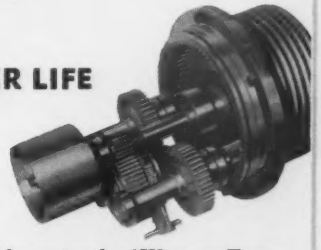
Capacities ¼-ton to 10 tons

your best buy for— MORE PRODUCTION



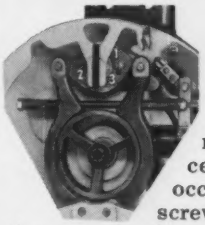
Fine balance and heavy-duty design make possible the continuous handling of tough jobs on any duty cycle for which a 30 minute NEMA motor is satisfactory. All gears and pinions are alloy steel, heat-treated. Their ductile core is shock resistant to severe service stresses. Anti-friction bearings throughout.

LONGER LIFE



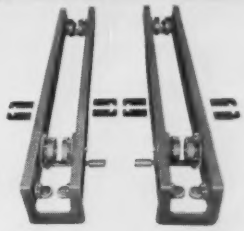
Strength of gear teeth of WRIGHT Frame 2 and Frame 3 *Speedway* Hoists has been doubled by a change in contour and grain structure of the metal. Internal gear ring with heavy flange cross section is bolted to drum at six points and provides extreme resistance to distortion.

EASIER MAINTENANCE



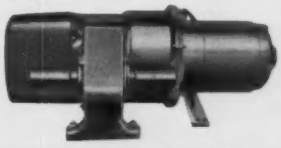
There is "*Nothing to Adjust but the Cam*" to keep the motor brake in perfect adjustment. When excessive load drift occurs...remove the screw shown at Position 1, swing the cam until Position 2 is in line and replace the screw. Position 3 is provided for the final one-third of brake lining wear. Brake springs and solenoid never need adjustment!

Build Better Cranes Save Money too! with WRIGHT END TRUCKS CRANE DRIVE UNITS *SPEEDWAY* HOISTS



WRIGHT END TRUCKS

For motor-driven cranes and hand traveling cranes—both top-running and under-hung types. Timken Bearings throughout. Wide range of capacities up to 10 tons. Structural steel construction is lighter and stronger than cast frames.



WRIGHT CRANE DRIVE UNIT

For crane and double-beam trolley propulsion. Electric motor transmits power through fluid drive to well-proportioned gear reduction. Units are equipped with WRIGHT-designed solenoid "drag" brake. Size 1 Drive Unit has motors up to 2 HP...Size 2 has motors 3 HP to 7½ HP.

For Complete Information

Write for these Booklets—

DH-73 • New Electric Chain Hoist
DH133B • Frame 1 *Speedways*
E58 • Frame 2 & 3 *Speedways*

Motor Driven Cranes

227 • Underhung, Single Bridge
DH448 & DH449 • Top-Running
DH431A • Crane Drive Units

Wright Hoist Division
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

NEW CUT-OFF WHEEL

AVERAGES 33% LONGER LIFE!

The records being set for all-round cutting efficiency by Bay State's new BZ2AA cut-off wheel are the results of careful and continuous research.

Cut-away wheel section showing reinforcement between layers of bonded abrasive.

Modern cut-off operations involve tremendous speeds, pressures and temperatures. If one of the three major cut-off wheel components . . . abrasive, bond or reinforcement . . . wears at a different rate from the others, cutting efficiency and wheel life fall off drastically. In the BZ2AA, Bay State has developed a new method of controlling these wear rates through the use of an improved bond. Now the three components are more perfectly matched, resulting in peak grinding efficiency.

In controlled laboratory tests the new BZ2AA wheel lasted an average 33% longer than the runner-up, Bay State's BZ2. Below are results of two such tests. They are typical of hundreds which have been confirmed in cutting gates and risers in leading foundries across the country.

Test #104 — Dry cutting cold rolled steel 1" square.
Wheel size: 16 x ⅛ x 1

	No. of cuts per wheel	
	BZ2	BZ2AA
	156	228
	157	193
	161	210
Total cuts	474	631
Average	158	210

Result: 33% more cuts per wheel with BZ2AA

Test #210 — Dry cutting cold rolled steel 1½" round.
Wheel size: 16 x ⅛ x 1

	No. of cuts per wheel	
	BZ2	BZ2AA
	58	71
	57	82
Total cuts	115	153
Average	57.5	76.5

Result: 33% more cuts per wheel with BZ2AA

The best proof of the BZ2AA's superiority is a test in your own cleaning room. Your Bay State representative will welcome the opportunity to arrange for such a test.

Write for descriptive sheet with full information.

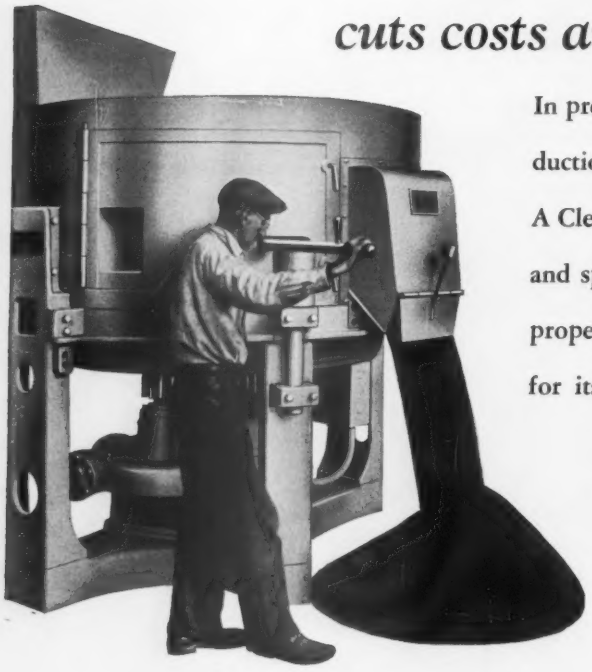
BAY STATE ABRASIVES

BAY STATE
WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Mass.
Branch Offices and Warehouses: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh.
Distributors: All principal cities. Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario.

Circle 585 on Page 51

the *Clearfield* mixer



cuts costs and speeds production

In preparing foundry sand, if you can speed production and maintain high quality *you cut costs.* A Clearfield Mixer, with its speed, dependability and special mixing features, prepares your sand properly and exactly as you want it, thus paying for itself many times over.

Write today for Catalog No. 83. Clearfield Mixers are available in many sizes to meet every need.

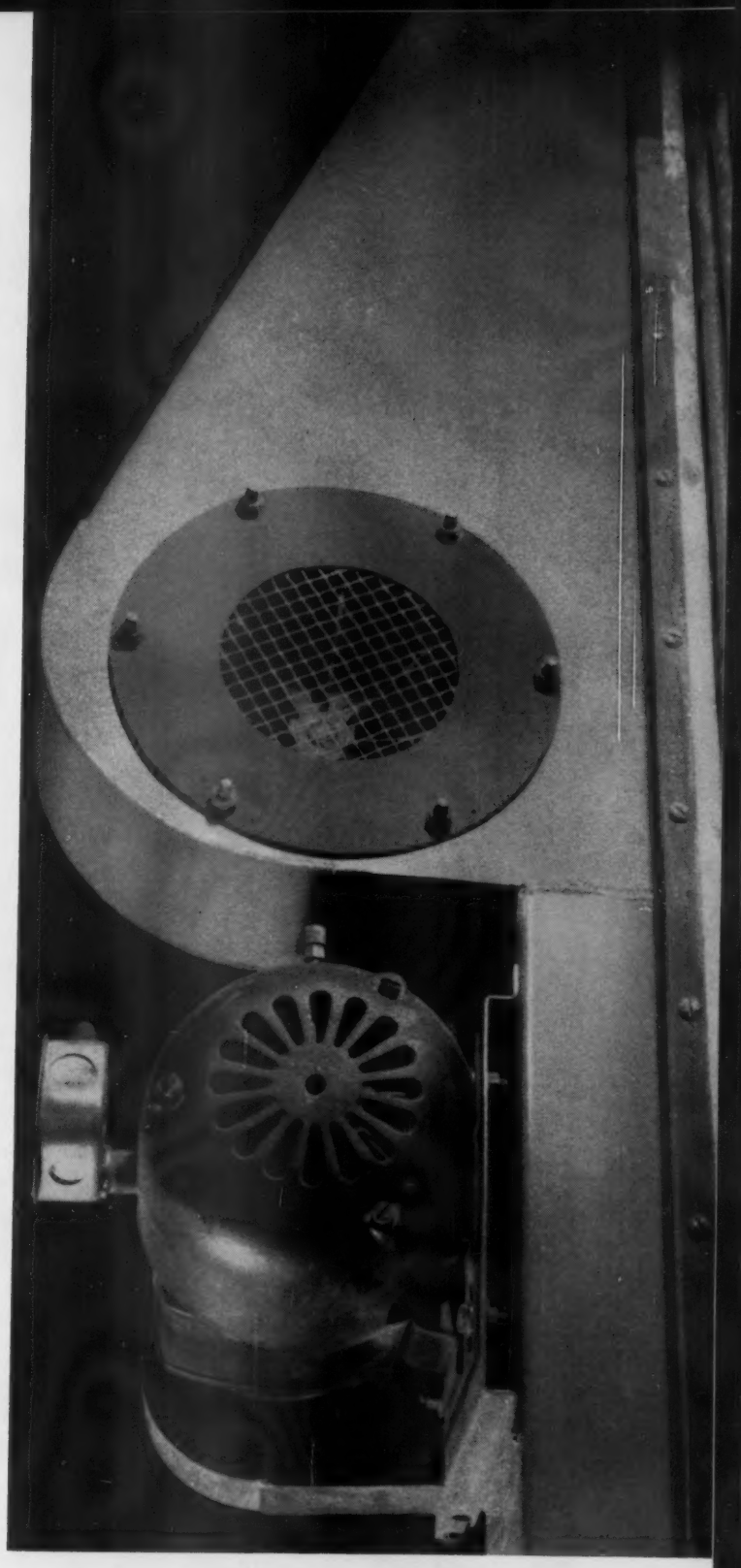
CLEARFIELD MIXER

fast, thorough sand preparation

CLEARFIELD MACHINE COMPANY
CLEARFIELD PENNSYLVANIA, U. S. A

Circle 586 on Page 51

You're looking at the exclusive key to continuous dust collecting!



You are inside a Pangborn Dust Collector. And this is Pangborn's traveling manifold . . . the exclusive self-cleaning development that permits continuous suction at highest efficiency. The result is the incomparable performance of cloth type collectors with minimum resistance to air flow and with no shutdown required.

Typical Pangborn engineering . . .

This advance is particularly important in collecting finely-divided dry dusts. But the Pangborn engineering it typifies is important to *any* dust-producing plant. It is not enough to place a dust collector within a plant. An efficient dust collecting system must be *scientifically* planned, designed and constructed to handle effectively a specific dust problem. This *thinking* is incorporated into every Pangborn proposal.

. . . that can help you

One of Pangborn's comprehensive line of dry and wet dust collectors can be utilized in a Pangborn-engineered dust system to solve *your* dust problem . . . whether it involves any kind of fine, coarse, dry, moist, corrosive, hot or obnoxious dusts.

The Pangborn engineer in your area will be glad to take off his jacket and go to work for you. He is a dust *expert* and will discuss your individual problem at no obligation. And, for more information, write for "Out of the Realm of Dust" to: PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Dust Control and Blast Cleaning Equipment.*

Pangborn CONTROLS DUST

Circle 587 on Page 51

This is it... THE NEW MIRACLE LIQUID PARTING

DELTA PART-RITE

FOR PERFECT MOLDS AND CORES

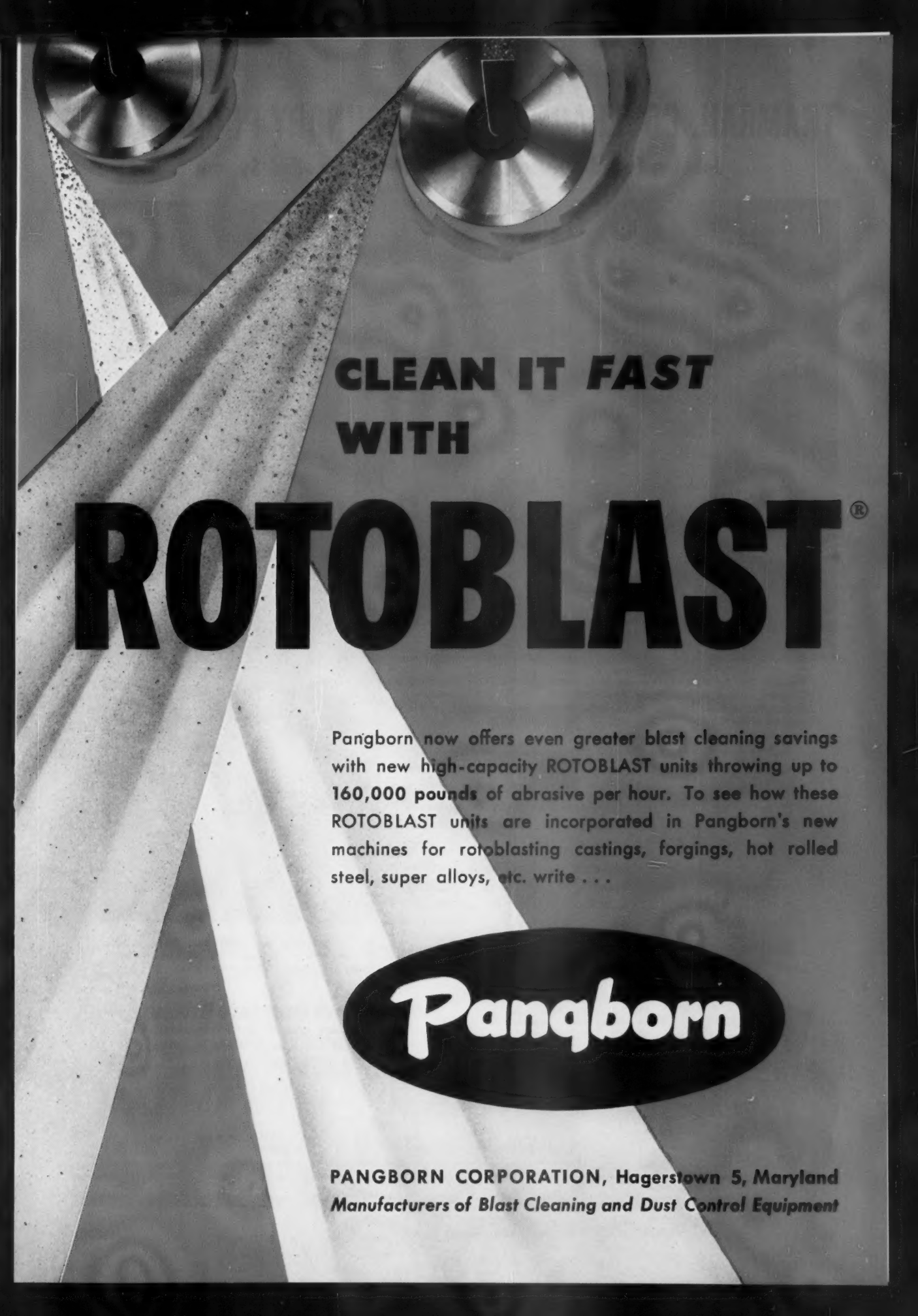
- Sand flows and packs freely to give perfect reproductions of pattern details.
- Patterns and core boxes stay cleaner longer with one application.
- No sand sticking.
- Use at any temperature.
- Protects patterns and core boxes against corrosion.
- Water repellent — contains moisture blocking agent.
- High lubricity reduces sand abrasion damage.
- Use sparingly — a micro-film is all that's necessary on patterns and core boxes.
- Fast, easy, economical. Costs less to buy, even less to use.

Working samples and complete literature on Delta Part-Rite will be sent to you on request for test purposes in your own foundry.

DELTA

DELTA OIL PRODUCTS CORP.
MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN


CLEAN IT FAST
WITH
ROTOBLAST®
Pangborn now offers even greater blast cleaning savings with new high-capacity ROTOBLAST units throwing up to 160,000 pounds of abrasive per hour. To see how these ROTOBLAST units are incorporated in Pangborn's new machines for rotoblasting castings, forgings, hot rolled steel, super alloys, etc. write . . .
Pangborn
PANGBORN CORPORATION, Hagerstown 5, Maryland
Manufacturers of Blast Cleaning and Dust Control Equipment

TRAMRAIL COVERAGE *SPEEDS* FOUNDRY PRODUCTION

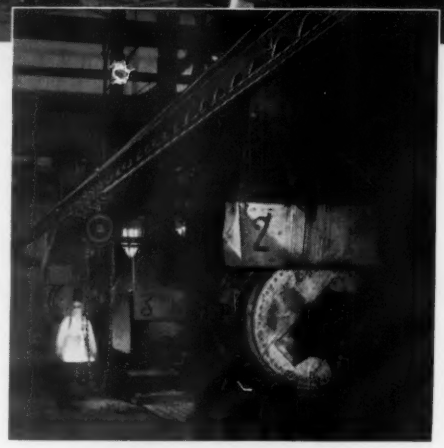
Jobbing Foundry Cuts Costs with Hand-Propelled System

Metal is quickly transferred to the hand-pouring ladles. This Cleveland Tramrail system is completely hand-propelled. Gray iron, aluminum, magnesium, brass, bronze, and monel castings are produced in this jobbing foundry.

When one considers that as much as 250 tons of materials must be moved to produce one ton of finished castings, depending on casting size, the importance of easing and speeding foundry handling is self-evident. Saving just one minute on every ton handled will reduce production time by over four hours.

Cleveland Tramrail equipment enables such tremendous time savings that frequently the output of a plant is increased by 25% to 100% without adding an additional foot of floor area.

Why not give Cleveland Tramrail a trial in your foundry? A representative will be glad to give you the details.



Bull ladles with hot metal from these electric furnaces are easily conveyed on the overhead Tramrail directly to the pouring floor.

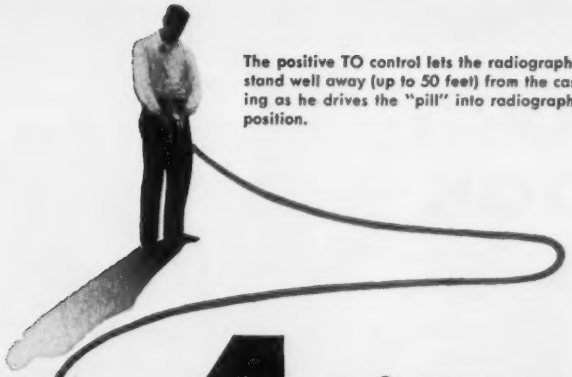
GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3831 East 286 Street, Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Circle 590 on Page 51

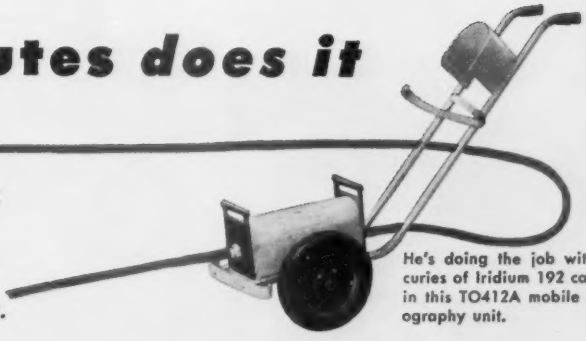


The positive TO control lets the radiographer stand well away (up to 50 feet) from the casting as he drives the "pill" into radiographic position.

4 minutes *does it*

The man up there radiographing that 2" thick steel casting down there will have the job done in four minutes.

That's how fast modern gamma radiography is.



He's doing the job with 50 curies of Iridium 192 carried in this TO412A mobile radiography unit.

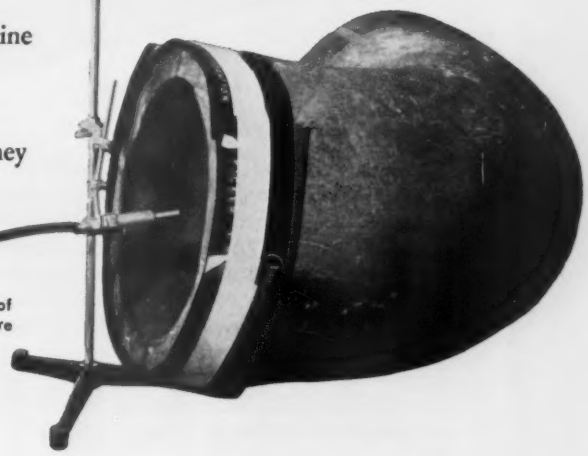
The isotope he's using (Iridium 192) will give him 2% sensitivity, too. Matter of fact, you can easily get 2% sensitivity in sections up to 6" of steel, brass, copper, bronze . . . even *lead* . . . when you match the isotope to the job.

Makes no difference what you *make* or *buy* or *sell* (plastics, light metals, fabricated parts, assemblies—the list is endless) if it needs radiographic "seeing into" for quality control, we have the machine (gamma or x-ray) to do it most efficiently.

If *you are* confronted by an inspection problem why not let our consulting radiographers see what they can do for you? It will cost you nothing, may save you a lot. Call your local Picker* representative or write us outlining the situation.

Picker x-ray

25 South Broadway, White Plains, N. Y.



One "shot" radiographs the entire girth of the casting. Picker Flexible Film Holders are quickly taped on, quickly removed.

**There's probably a Picker district office near you (see your local 'phone book).*

PICKER . . . one stop for everything in industrial fluoroscopy and radiography

ANDREX lightweight portable x-ray units—130 KV, 160 KV, 200 KV, 260 KV and *Androscope* X-ray Stress Analyzer.

PICKER x-ray units—5 to 50 KV, 150 KV (stationary and mobile), 270 KV portable, 260 KV heavy-duty, x-ray diffraction apparatus, rayproof inspection cabinets.

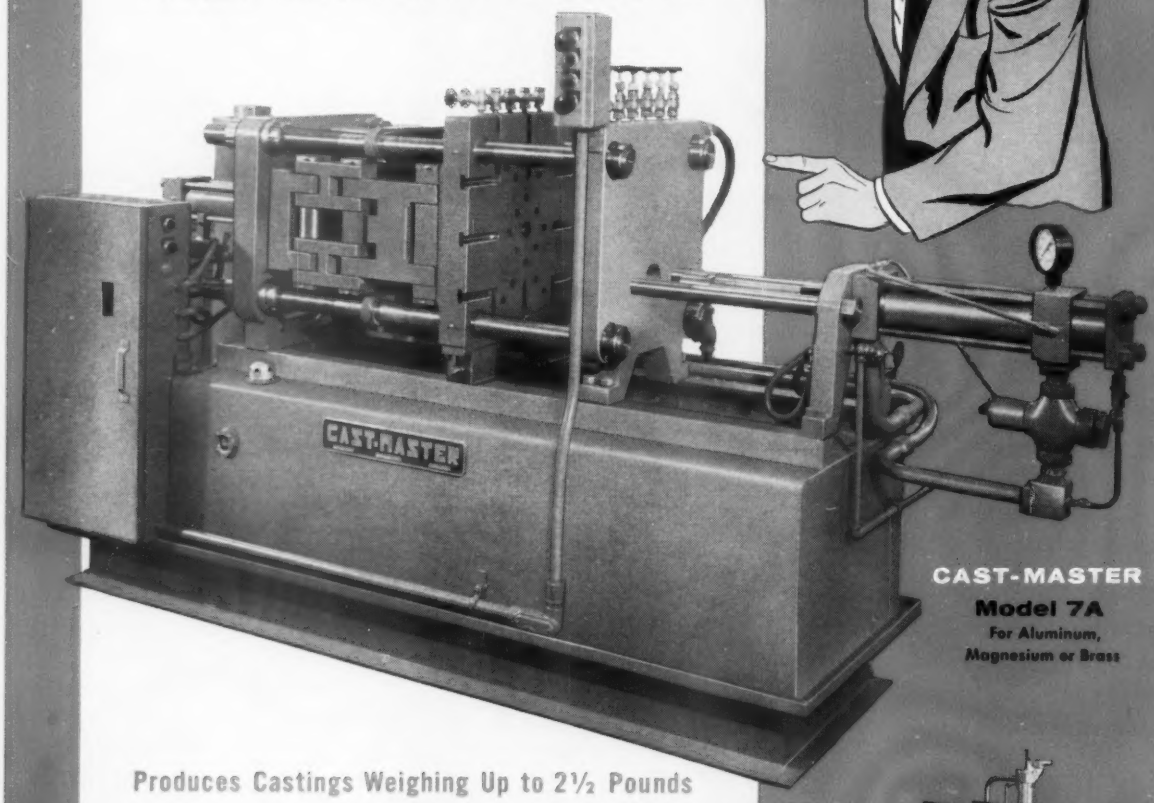
ACCESSORIES . . . films, tanks, darkroom sundries, illuminators, *everything.*

TECHNICAL OPERATIONS units for isotope radiography—sources, equipment, containers for Iridium 192 Cesium 137 Cobalt 60 and Thulium 170.

Circle 591 on Page 51

DELIVERY FROM STOCK

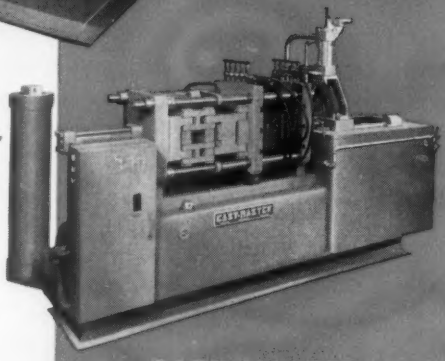
Available in Both ZINC and ALUMINUM Models



CAST-MASTER
Model 7A
For Aluminum, Magnesium or Brass

Produces Castings Weighing Up to 2½ Pounds

Great news for producers of small castings! Now you can get *quick, direct-from-stock delivery* on two new Cast-Master Die Casting Machines: Model 7Z for Zinc, Tin, Lead — Model 7A for Aluminum, Magnesium, Brass. Both feature the same outstanding design and rugged construction of the larger models now operating in America's leading plants. That means solid steel platens, extra heavy linkage with multiple shear points, and many other details that make possible safer, high-speed production of mirror-smooth, hardware-finish castings.



CAST-MASTER
Model 7Z
For Zinc, Tin and Lead

Send For Brochure Giving Full Details And Specifications

Eastern Rep. Milton Harmon, 18 Rock Rd., Milford, Connecticut
Midwest Rep. C. W. Stone Co., Minneapolis, Minnesota
Western Rep. Sydney J. Wills, 2120 Strand, Hermosa Beach, Calif.

CAST-MASTER Inc.
23901 AURORA ROAD
BEDFORD, OHIO

Circle 592 on Page 51

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FOUNDRY

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FURTHER INFORMATION on Advertised Products ?

April 1958

SIMPLY CIRCLE AD ITEM NUMBER BELOW

521	536	551	566	581	596	611	626
522	537	552	567	582	597	612	627
523	538	553	568	583	598	613	628
524	539	554	569	584	599	614	629
525	540	555	570	585	600	615	630
526	541	556	571	586	601	616	631
527	542	557	572	587	602	617	632
528	543	558	573	588	603	618	633
529	544	559	574	589	604	619	634
530	545	560	575	590	605	620	635
531	546	561	576	591	606	621	636
532	547	562	577	592	607	622	637
533	548	563	578	593	608	623	638
534	549	564	579	594	609	624	639
535	550	565	580	595	610	625	640

641	656	671	686	701	716	731	746
642	657	672	687	702	717	732	747
643	658	673	688	703	718	733	748
644	659	674	689	704	719	734	749
645	660	675	690	705	720	735	750
646	661	676	691	706	721	736	751
647	662	677	692	707	722	737	752
648	663	678	693	708	723	738	753
649	664	679	694	709	724	739	754
650	665	680	695	710	725	740	755
651	666	681	696	711	726	741	756
652	667	682	697	712	727	742	757
653	668	683	698	713	728	743	758
654	669	684	699	714	729	744	759
655	670	685	700	715	730	745	760

761	776	791	806	821	836	851	866
762	777	792	807	822	837	852	867
763	778	793	808	823	838	853	868
764	779	794	809	824	839	854	869
765	780	795	810	825	840	855	870
766	781	796	811	826	841	856	871
767	782	797	812	827	842	857	872
768	783	798	813	828	843	858	873
769	784	799	814	829	844	859	874
770	785	800	815	830	845	860	875
771	786	801	816	831	846	861	876
772	787	802	817	832	847	862	877
773	788	803	818	833	848	863	878
774	789	804	819	834	849	864	879
775	790	805	820	835	850	865	880

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Page No.	Title of Article
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NAME .....

POSITION .....

FIRM .....

STREET .....

CITY ..... ZONE.....

STATE .....

PRODUCT MANUFACTURED .....

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643	658	673	688	703	718	733	748
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645	660	675	690	705	720	735	750
646	661	676	691	706	721	736	751
647	662	677	692	707	722	737	752
648	663	678	693	708	723	738	753
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650	665	680	695	710	725	740	755
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768	783	798	813	828	843	858	873
769	784	799	814	829	844	859	874
770	785	800	815	830	845	860	875
771	786	801	816	831	846	861	876
772	787	802	817	832	847	862	877
773	788	803	818	833	848	863	878
774	789	804	819	834	849	864	879
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PRODUCT MANUFACTURED .....

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FIRST CLASS
Permit No. 36
CLEVELAND, OHIO

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

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FIRST CLASS
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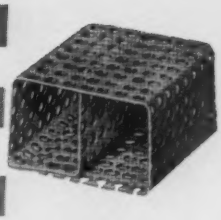
NAME THE CASTING JOB FANNER HAS THE CHAPLET OR CHILL



When you need chaplets or chills . . . remember that only FANNER has a complete line of chaplets and chills for every casting requirement. Each one is precision engineered and manufactured to tolerances of ± .002 to insure better castings . . . savings in labor and reduction of scrap losses. Regardless of the kind of metal you use or type of casting you produce, you can secure the exact chaplets or chills you need from this one source. As a result, when you standardize on FANNER you save on delivery, on production and in lower costs. Write for our chaplet and chill catalogs — both are filled with valuable data on casting methods.

THE FANNER MANUFACTURING CO.

Designers and Manufacturers of Fine Fanner Chaplets and Chills

BROOKSIDE PARK CLEVELAND 9, OHIO

Circle 593 on Page 51

FOUNDROMATIC
Dielectric
SAND CORE OVEN

The *Only* Electronic Oven That Can Give You These 4 Advantages

- **Exact Quality Control** . . . Adjustable electrode control permits correct compensation for physical variance in cores. Burning and incomplete baking are eliminated, even when cores have very thick or very thin sections.
- **"Load Master" Protection** . . . An automatic grid control assures correct drive to the oscillator tube regardless of oven load. Automatic conveyor control prevents electrical overload by controlling belt travel when load is too great for normal operation.
- **Simplified Operation** . . . "Tell-All" control panel, at eye level, enables operator to keep on top of the complete operation at all times — to maintain top quality with maximum speed and accuracy.
- **Extra Safety** . . . The *Foundromatic* core oven provides maximum safety for operator and machine. Metal cabinet is designed to trap radiation. Door interlocks shut off power when cabinet is opened for inspection.

Foundromatic is an Allis-Chalmers trademark.

Foundry Men — Be sure you get the fast production and reduced core costs possible with the *Foundromatic* sand core oven. For the complete story, see your A-C representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin. Ask for new Bulletin 15B7306C.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5326

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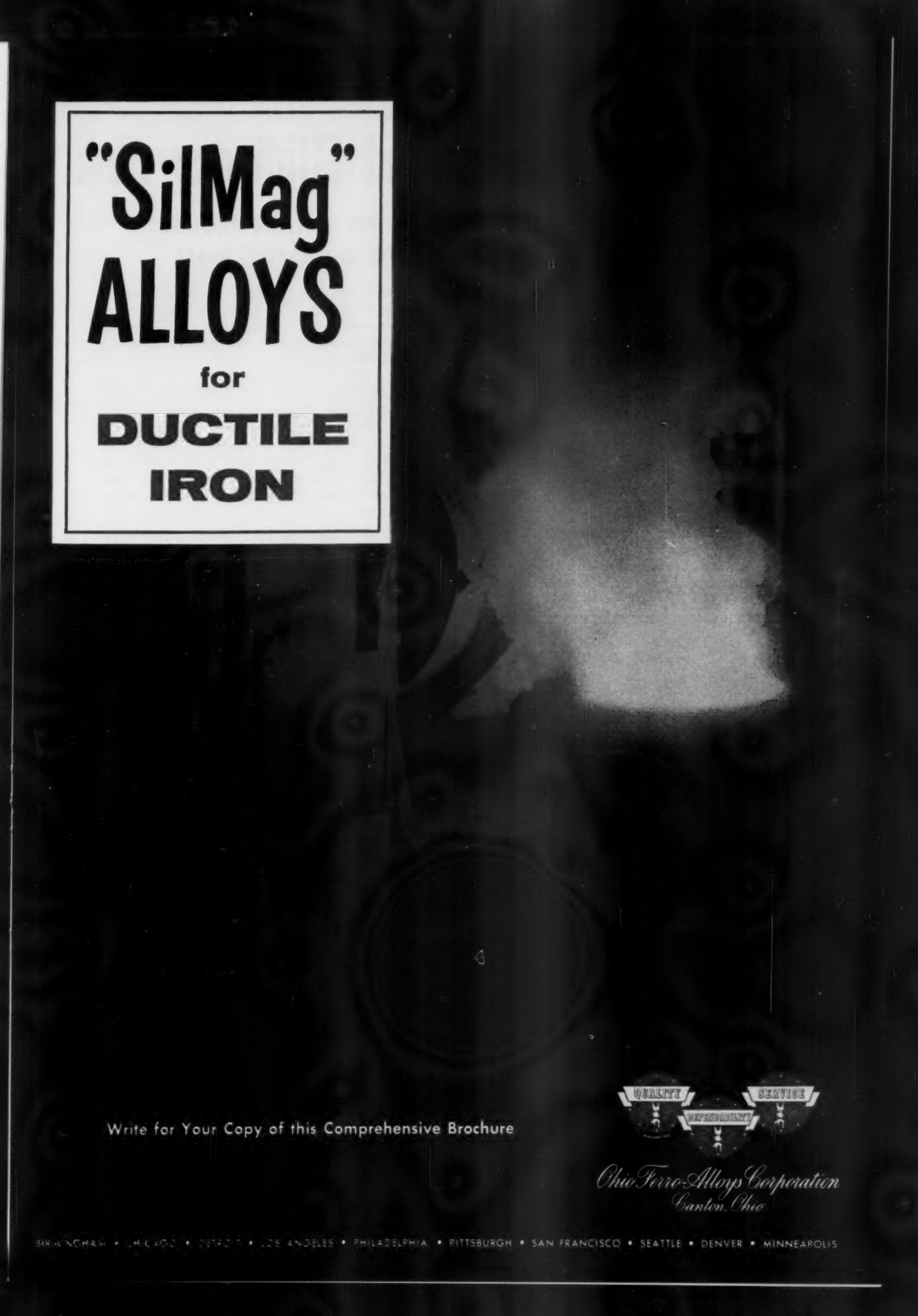
Circle 595 on Page 51→


"SilMag"
ALLOYS
for
DUCTILE
IRON
Write for Your Copy of this Comprehensive Brochure
QUALITY
SERVICE
DEPENDABILITY
Ohio Ferro-Alloys Corporation
Canton, Ohio
BIRMINGHAM • CHICAGO • DETROIT • LOS ANGELES • PHILADELPHIA • PITTSBURGH • SAN FRANCISCO • SEATTLE • DENVER • MINNEAPOLIS

For Maximum Control and Efficiency . . .

FAST INDIRECT ARC MELTING, ROCKING ACTION PRODUCE CLOSE QUALITY CONTROL AT LOW OPERATING COST

Detroit Electric Furnaces offer three basic advantages for metal melting: Indirect arc heat for uniform high quality; controlled rocking action for maximum heat utilization and homogeneous alloy mixture; and quick shell interchange for economical melting of different alloys.

Close Control of Analysis

By using an indirect arc in a sealed chamber, Detroit Electric Furnaces produce alloys of consistent analysis through heat after heat. Electrodes remain clear of the molten bath at all times. The sealed chamber holds gaseous contamination to a minimum. Melting is rapid, yet final pouring temperature can be duplicated or varied at will.

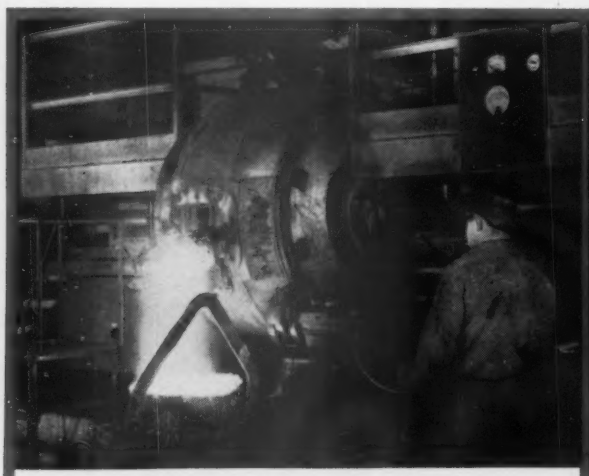
Double Economy with Rocking Action

Automatic rocking action washes the metal over a greater surface of the lining. This provides fast, efficient metal melting and stirs the bath constantly to assure homogeneity of the metal. Rocking action prolongs lining life by preventing excessive refractory temperatures. The optimum melting cycle for any particular heat can be determined then preset with the rocking controller.

Vary Production Schedules, Melt Different Alloys Easily

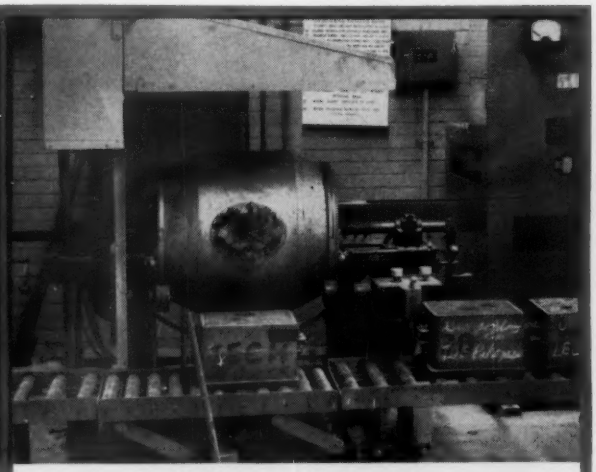
Detroit Electric Furnaces are designed to meet diversified melting requirements as well as long run schedules. Using the size furnaces suited to your production volume, a wide range of ferrous and nonferrous alloys can be handled with quickly interchangeable shells. This greatly lowers your initial investment.

Send us your operating data and our engineers will show you how Detroit Electric Furnaces can best meet your needs. Write today, or mail the coupon on the opposite page for full catalog information.



Type AA—1500 lbs. capacity

Produces 5-8 tons of metal per 8-hour shift. Pedestal-mounted electrodes with automatic arc control. Conical or cylindrical shell. 250 k.w. (brass) or 400 k.w. (iron) transformer.



Types GMS/GMT—60/100 lbs. capacity

Ideal for research and limited production. Type GMS-30 k.w. produces 800 lbs. per shift. Type GMT-50 k.w. produces up to 1200 lbs. Base-mounted electrodes. Single transformer and meter cabinet.

DETROIT ELECTRIC FURNACE DIVISION

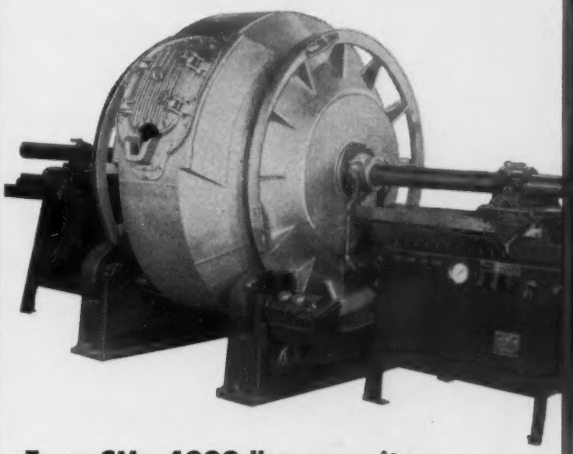
Kuhlman Electric Company

Bay City, Michigan

MEMBER FEMA

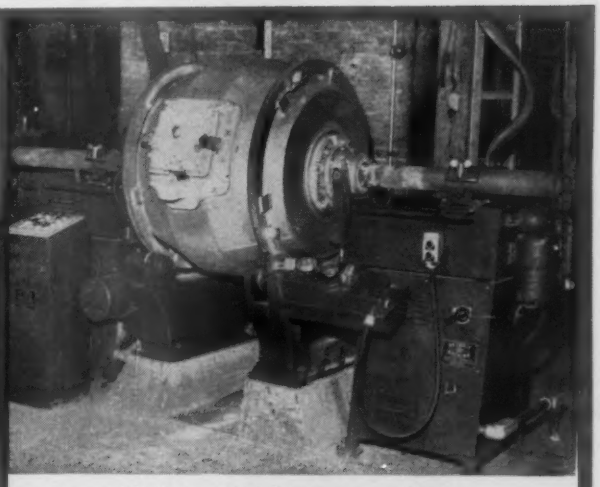
Foreign Representatives: In BRAZIL—Equipamentos Industrias, "Elsa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Cassaro & Co., Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

Melt with Detroit ROCKING Electric Furnaces



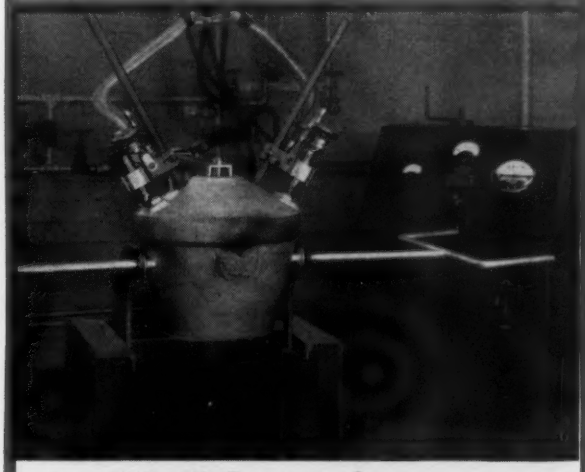
Type CM—4000 lbs. capacity

Produces 10-16 tons of metal per day. Pedestal-mounted electrodes. Conical or cylindrical shell. 400 k.w. (brass), 600 k.w. or 750 k.w. (iron) transformers. Also available: Type CC, 3000 lbs. capacity, rated at 350 k.w. or 600 k.w.



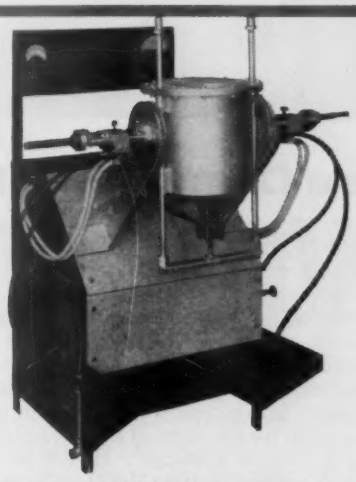
Type LFNP—500 lbs. capacity

For 2-4 tons of metal per shift. Pedestal-mounted electrodes. Conical shell. 150 k.w. transformer. Also available: Type LF-100 k.w., 200 lbs; Type LFC-125 k.w., 350 lbs; Type LFY-175 k.w., 700 lbs.



Type PT—15 lbs. capacity

Pot-tilting type for research and small production. Electrodes mounted in cover. Pot doubles as crucible. Single power unit has 12 k.w. transformer.



Type IC/ID—10/20 lbs. capacity

Investment casting type for precision castings. Type IC rated at 12 k.w., Type ID at 20 k.w. Furnace inverts to pour into attached mold.

FREE CATALOG

Detach and mail coupon for full information on Detroit Electric Furnaces.

Detroit Electric Furnace Division
Kuhlman Electric Company
Bay City, Michigan

Please send me a copy of your catalog No. 559 plus specific information on the Detroit Electric Furnaces checked at right.

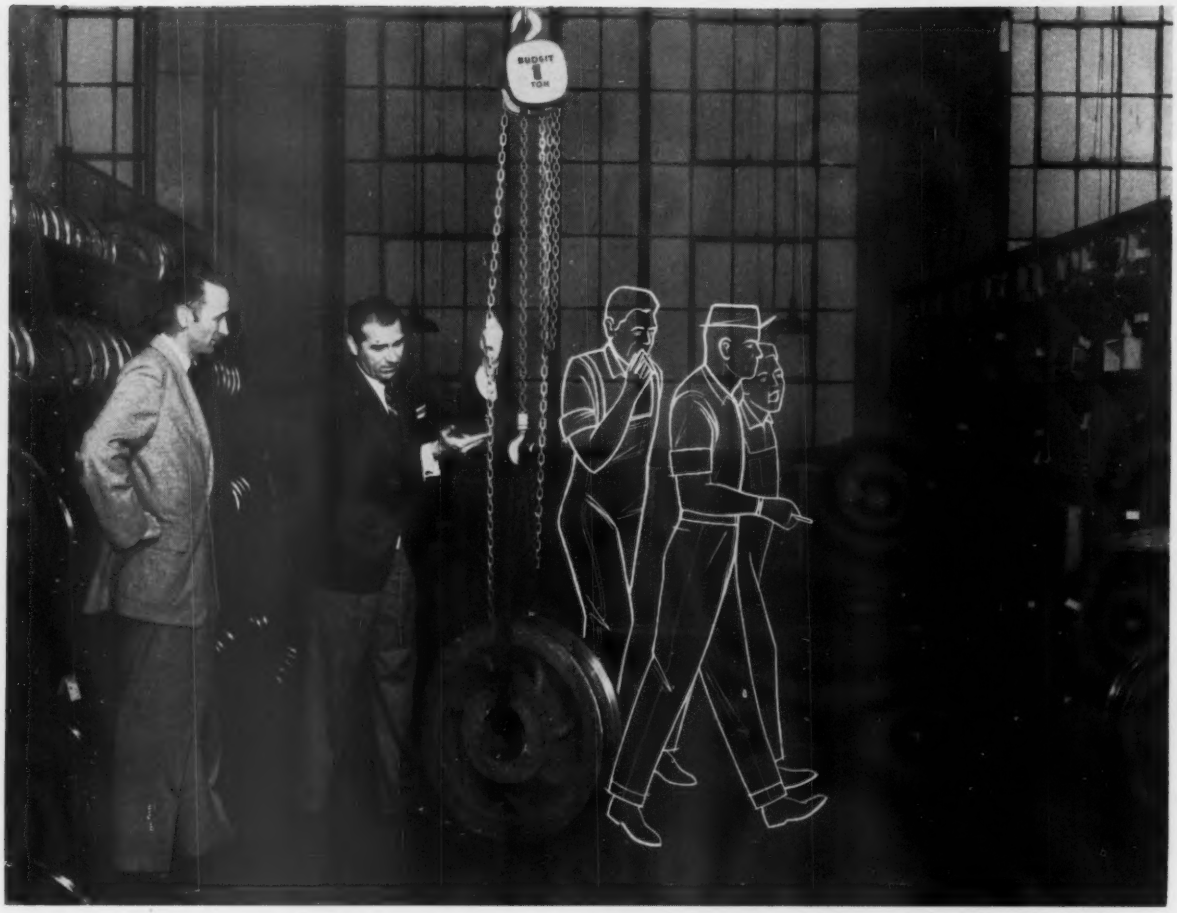
Name_____ Title_____

Company_____

City_____ Zone_____

State_____

- ☐ AA
- ☐ CM
- ☐ LFY
- ☐ GMS
- ☐ PT
- ☐ IC



Free Demonstration Anywhere in Your Plant

See proof that the 'Budgit' Chain Block can cut your load handling costs

Be convinced — take us up on this free demonstration offer now.

Choose any plant area where lifting is a problem and a hoist can be hung. Then call your local 'Budgit' Distributor. See the yellow pages of your phone book — or write us for the name of the one nearby. He will bring and hang up a 'Budgit'. He will prove hoisting is an easy one-man job that frees manpower for other work.

'BUDGIT' SAVES TIME, ENERGY, MONEY

You will learn how only 25 lbs. of muscle effort can lift a 500 lb. load. You will see how fast the big, automatic load brake operates in spotting loads exactly where you want them. You will learn how light weight and strength are combined to produce a safe hoist that cuts lifting costs in emergencies, maintenance, construction, production.

All this and more are yours to see right in your own plant — without obligation.

'Budgit' Aluminum Chain Blocks are made in ¼ to 10-ton capacities, in top hook and Army-Type trolley styles. Spark and corrosion resistant models, too. Prices start at $125.

Call your Shaw-Box distributor today or ask us for Bulletins 15010-10, 15010-16, 15010-17, 15010-18.

Authorized service stations from coast to coast save time, trouble and money for every 'Budgit' user.

58C-2

MAXWELL MANNING M&M & MOORE, INC. TRADE MARK

'Budgit'® **CHAIN BLOCKS**

MANNING, MAXWELL & MOORE, INC.

SHAW-BOX CRANE & HOIST DIVISION

386 W. Broadway • Muskegon, Michigan

Builders of "SHAW-BOX" and 'LOAD LIFTER' Cranes, 'BUDGIT' and 'LOAD LIFTER' Hoists and other lifting specialties. Other Divisions produce 'ASHCROFT' Gauges, 'HANCOCK' Valves, 'CONSOLIDATED' Safety and Relief Valves, and 'AMERICAN' and 'AMERICAN-MICROSEN' Industrial Instruments.

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

Circle 597 on Page 51

NEVILLE FOUNDRY COKE

NEVILLE Foundry Coke is scientifically processed from clean, washed coals containing a high percentage of Pocahontas. We provide this extra measure of quality at the very beginning of our foundry coke production. And it carries right through to help you produce more high quality castings.

Neville Foundry Coke is a dense, strong uniform coke, with more fixed carbon and less ash and sulphur. That's why it consistently provides maximum melting temperatures which enable you to produce a hotter, cleaner, more fluid iron.

Neville Pig Iron and Neville Coke for the Foundry Trade

If you're interested in improving the quality and increasing the efficiency of your gray iron castings production, specify *Neville* the next time you order foundry coke. ***And if you need any technical help, our engineers will be glad to meet with your production people.***

COKE • CEMENT • PIG IRON • COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON

Circle 598 on Page 51

precise heat for precision casting

You'd *expect* the accurate heat of an induction furnace to be an important consideration in permanent mold, shell mold, and investment casting . . . and it *is!* But in addition to precise temperature control, Ajax-Northrup high frequency induction furnaces provide the precision foundry with *flexibility*, *purity*, and *economy*. That's why Ajax leadership in melting for precision casting has never been challenged.

One furnace—hundreds of alloys: Ajax-Northrup furnaces can handle any one or all of the hundreds of ferrous and non-ferrous alloys being made today. For many alloys, it's the only furnace that *can* be used. Magnet alloys, for example, depend on the inherent stirring action which assures ideal dispersion of all elements throughout a melt . . . and the most uniform possible cast part analysis.

Pure metal protects part quality: There's no flame, no smoke, no physical contact between coil and metal. Melts are always 100% on analysis, because there's no chance of contamination . . . particularly important when you're dealing with the finicky alloys common in precision casting.

A better melt at a lower cost per melt: Because every melt is uniform and to exact composition, bad melts become a thing of the past. Subsequent machining is minimized. Ajax-Northrup's unique control system assures maximum melting efficiency—lower melting costs. And new, compact designs minimize floor space requirements, installation costs and maintenance.

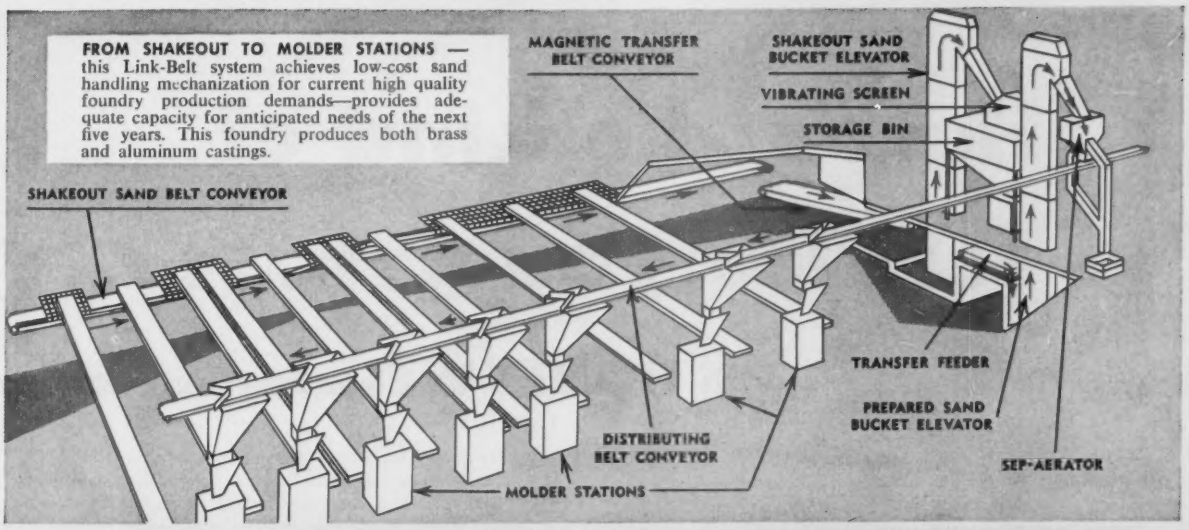
Induction heating & melting

AJAX

NORTHRUP

Available in every conceivable capacity from a few ounces to several tons . . . powered by massive motor-generator sets or economical converters . . . there's an Ajax-Northrup induction furnace sure to satisfy your needs perfectly. We'll gladly send you further information or, if you wish, arrange a meeting with qualified furnace engineers to discuss your special requirements. Ajax Electrothermic Corporation, Ajax Park, Trenton 5, New Jersey.

ASSOCIATED COMPANIES: AJAX ELECTRIC COMPANY-AJAX ENGINEERING CORPORATION


FROM SHAKEOUT TO MOLDER STATIONS — this Link-Belt system achieves low-cost sand handling mechanization for current high quality foundry production demands—provides adequate capacity for anticipated needs of the next five years. This foundry produces both brass and aluminum castings.
MAGNETIC TRANSFER BELT CONVEYOR
SHAKEOUT SAND BUCKET ELEVATOR
VIBRATING SCREEN
STORAGE BIN
SHAKEOUT SAND BELT CONVEYOR
TRANSFER FEEDER
PREPARED SAND BUCKET ELEVATOR
DISTRIBUTING BELT CONVEYOR
SEP-AERATOR
MOLDER STATIONS

DISTRIBUTING BELT CONVEYOR for prepared sand runs directly above individual molding stations. Conveyor is equipped with air-actuated duplex plows which deliver sand to series of molders' hoppers. Finger tip selection assures availability of sand where required and in quantity desired.

BRASS FOUNDRY achieves smooth coordination of sand handling and molding operations in compact area. Link-Belt equipment includes vibrating screen, storage bin, prepared sand bucket elevator, Sep-Aerator, overhead belt conveyor and molding stations.

In 1946...in 1956—Link-Belt helps Gardner-Denver Company

mechanize for greater profit

HAVING experienced many years of dependable, low cost handling of sand, molds and castings with Link-Belt equipment at their La Grange, Missouri foundry, Gardner-Denver Company again had Link-Belt mechanize their new Quincy, Illinois foundry.

Results — a clean, orderly foundry, maximum capacity, better working conditions, uniformly prepared sand, fewer rejects—all of which make for better castings at a lower unit cost. Yes, you get these and many more benefits when you mechanize with Link-Belt sand handling equipment. Call your nearby Link-Belt representative for consultation on your sand, mold and castings handling problems. Or write for Book 2423.

LINK-BELT

CONVEYORS AND PREPARATION MACHINERY

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World. 14.623

Here's the kind of service you get . . .

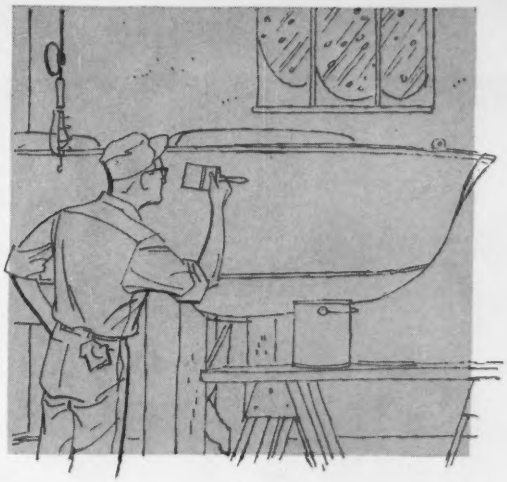
with HONEYWELL instrumentation

Bill Lewis, typical service engineer, proves how you can depend on Honeywell for fast, on-the-spot service even in emergencies.

3 It took Bill two hours to drive to the plant through the storm. He spotted the trouble immediately; a thermocouple and its protecting tube had burned out. It might have meant four to five thousand dollars' worth of damage.

Honeywell service begins when you first decide you need instruments, and continues long after they're installed. It includes:

- Preliminary engineering, even before specifications are written.
- Application engineering for installation and startup.
- Service engineering help from your nearby Honeywell branch.
- Periodic service and swift help in emergencies.
- Training of your operators at the Honeywell Instrumentation Education Center.



1 Bill Lewis, service engineer at Honeywell's Fort Wayne branch, was in his garage, touching up the paint on his 13-foot outboard. The bowling match had been called off that night because of the snowstorm, and Bill was glad to be home.

2 At 9:30 a call came from the Crosby Laughlin Division of American Hoist and Derrick Company in Fort Wayne. A controller on a galvanizing kettle wasn't working and unless it was fixed fast, the pot would either freeze or burn out. Bill said he would be out right away.

4 Bill didn't have a thermocouple with him that would fit, so he improvised a temporary couple and protecting tube and got the system going. Early the next morning he called the Honeywell branch in Indianapolis and had the correct thermocouple and tube shipped quickly to the plant. Next day, he carefully checked out the entire installation.

5 Now, Crosby Laughlin Division is signed up with the Honeywell Periodic Service Plan, and its complete instrumentation is checked and serviced every month. Any spare parts needed are now available at Honeywell's Fort Wayne branch. Bill hasn't had to make another emergency call to the plant since.

Around-the-clock help in emergencies is but one of many Honeywell services that give you extra value for your investment in instruments. Get the complete service story from your nearby Honeywell field engineer. He's as near as your phone.

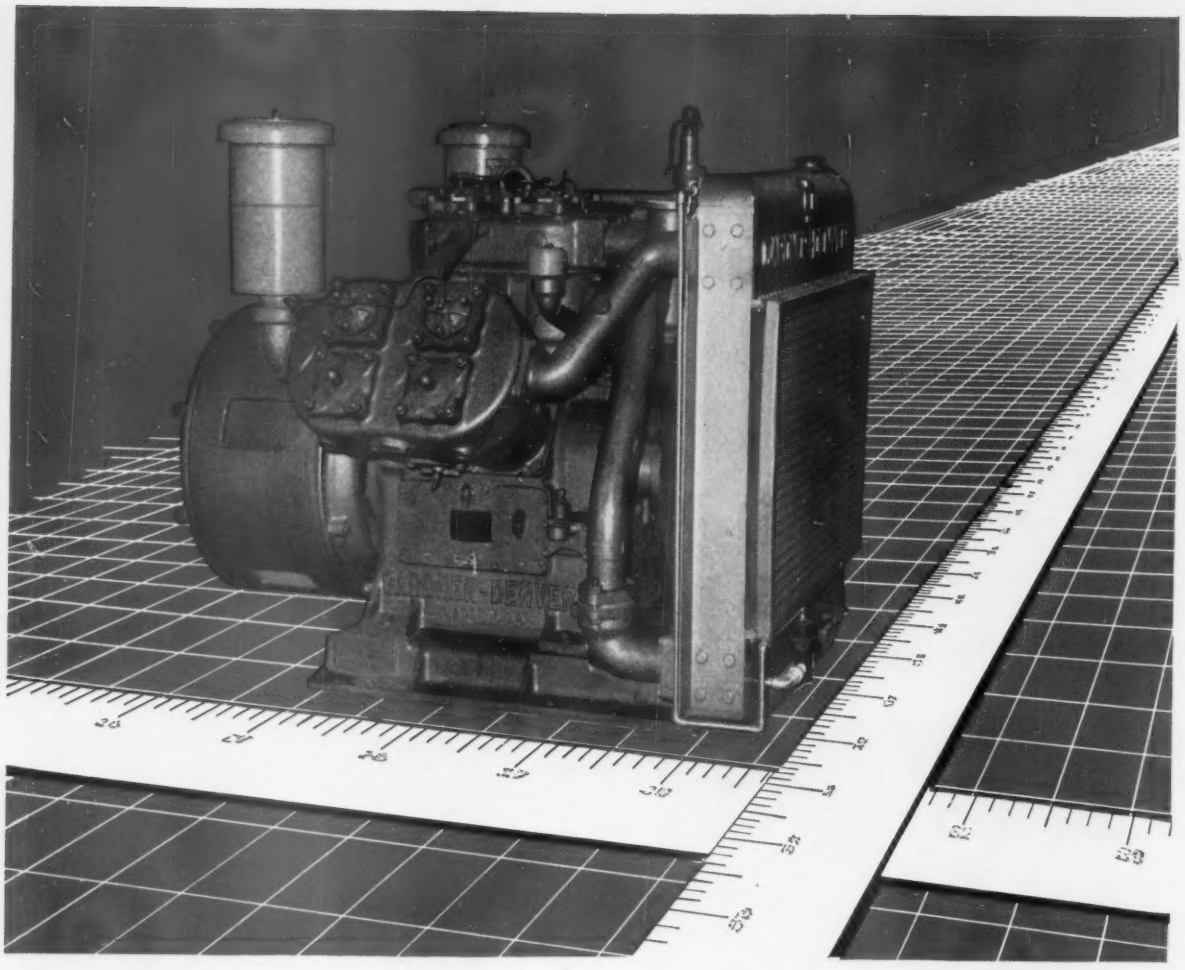
MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Products Group* . . . Brown Instruments, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

H HONEYWELL

First in Controls

Circle 601 on Page 51



Made to the measure of smaller space— this high-capacity Gardner-Denver compressor

Lots of power and high capacity in a compact, space-saving package. That's the Gardner-Denver WBN compressor—an easy, economical way to side-step the soaring cost of factory floor space.

Occupying only 34 sq. ft. of space, this 200 hp unit is rated at 1150 cfm piston displacement. In many instances, this volume permits retirement of two smaller units, with corresponding savings in space.

The Gardner-Denver WBN needs no special base. Just bolt it down, hook it up and put it to work. It is available with a self-contained radiator-intercooler that conserves cooling water, or with a tube-type intercooler.

Gardner-Denver compressors are available in seven space-saving models—from 39″ to 72″ long, 47″ to 68″ wide and 25 to 200 horsepower.

Write for complete information

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IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

Circle 602 on Page 51

Circle 603 on Page 51→

Pay less for more strength! Tenzaloy the self-aging aluminum alloy needs no heat treatment! If your aluminum castings are too large or too intricate for heat treatment, if your heat treating facilities are limited, if you need superior strength than you get from ordinary heat-treated alloy demand "Federated Tenzaloy" developed by Federated to meet the need for a superior aluminum alloy that ages at room temperature. Tenzaloy eliminates rejects due to warpage, expansion, and internal stresses caused by quenching. Tenzaloy finished properties are stable, proved by conclusive test data over a ten year period. No special foundry techniques are required. No fluxes. Castability is excellent with sand cast and plaster molds and many permanent molds. Tenzaloy will not "grow," produces corrosion-resistant castings with excellent polishing characteristics and anodizes clear white. Write for Tenzaloy Bulletin No. 103. Federated Metals Division, 120 Broadway, New York 5. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

FEDERATED METALS DIVISION OF

ASARCO

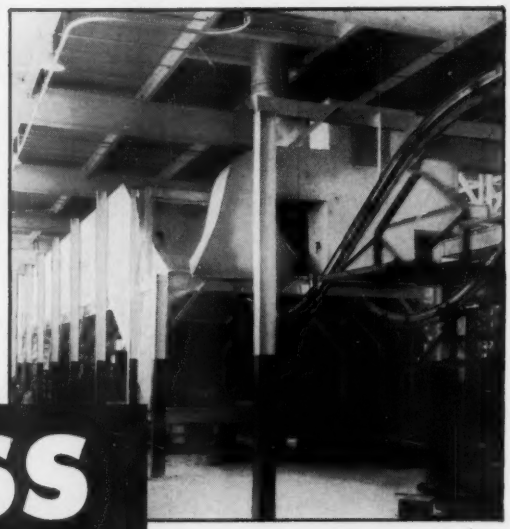
AMERICAN SMELTING AND REFINING COMPANY

TENZALOY is one of a complete series of Federated aluminum casting alloys. A new plant in Alton, Ill. will soon be in production to satisfy the requirements for Tenzaloy in the mid-west.

58-28

ROSS
Air Systems

ENGINEERED ATMOSPHERES
FOR BETTER PROCESSING



2 ROSS Controlled AIR UNITS

★ Help to Produce Better Castings
★ Help to Lower Production Costs

ROSS CORE OVENS

Properly controlled heat is the key to core baking that is consistently successful. Uniformity in baking in either batch or continuous ovens depends largely upon the skill with which the hot baking air is made to enter and then to circulate throughout the oven.

To accomplish this, engineers must know the behavior of air under all conditions of temperature and pressures, and how to control that air.

The consistently efficient operation of Ross Core Ovens in both ferrous and non-ferrous Foundries can be traced right back to this understanding of air movements.

ROSS CUPOLA AIR PRE-HEATERS

Here, too, the control of both the heating and the flow of the hot combustion air for the cupola charge is based on a thorough knowledge of air behavior.

The ROSS Hot Blast System delivers air up to 500°F. The new ROSS Tubular Heater ranges up to 1000°F. at 5 pounds pressure or higher. Both of these can be tied in with present cupola operations without interfering with them. Existing blowers can be used.

Why not ask to have a Ross Engineer call and discuss your problem of core curing and of getting better production from your furnace.

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means sand the same every time

SPECIFY BLACKHAWK SILICA, THE SAND WITH HIGH RESISTANCE TO CHEMICAL AND HEAT ACTION. OVER 99.7% PURE BY ACTUAL TEST

Blackhawk silica has the same purity, uniformity, and dependability with every order and in any quantity. That's what Standard specification means to you, Mr. Foundryman, whose product quality depends on the ingredients you use.

Standard's silica is mined from an area wonderfully rich in tremendous deposits of St. Peter's sandstone. Painstaking washing and grading processes produce foundry sands second to none in the world.

The Blackhawk brand possesses an unusually high sintering and fusion temperature point plus marked permeability which allows free passage of gases.

Standard's accessibility to both excellent rail and water transport facilities affords swift delivery anywhere in the nation. For your next order of silica sand, phone the Standard distributor in your area.

BLACKHAWK SILICA SAND

The Blackhawk brand—used throughout the foundry industry as steel molding sands, special core sands, opening and parting sands, and facing sands.

STANDARD SILICA COMPANY

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Silica Center of the World

Circle 605 on Page 51

MANHATTAN *Reinforced* CUT-OFF WHEELS are Safer!

Engineered *built-in* reinforcement enables a cut-off wheel to take the abuse and excessive strain of heavy cutting in foundry operations. Every Manhattan Reinforced Cut-Off Wheel is reinforced *two* ways, to assure double safe operation on the job. Special fibers in the bond increase the wheel's strength to withstand destruction from centrifugal force by 50%. In addition, special industrial super-strength synthetic reinforcement resists side-strain far beyond the endurance of conventional cut-off wheels. The result? Actual field reports show up to 25% increase in cutting efficiency and cleaning room production . . . on both stationary and swing-frame cut-off machines. At the same time, Manhattan cut-off wheels offer a high degree of safety and protection against breakage.

GRINDING WHEEL INSTITUTE MEMBER

Ask your Manhattan sales engineer to show you how to get faster, safer cutting and increased production efficiency . . . "More Use per Dollar" . . . with Manhattan Reinforced Cut-Off Wheels and other types of Manhattan high speed, heavy duty wheels.

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RMB41

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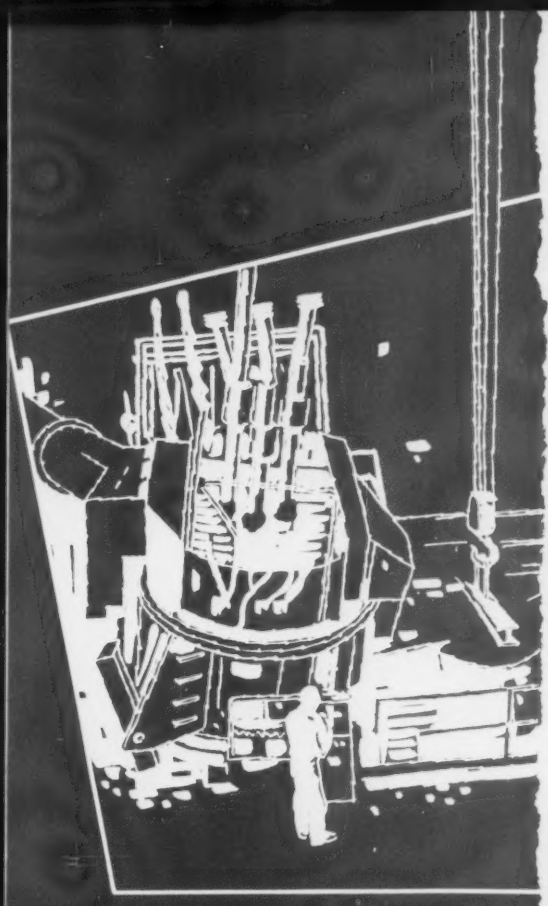

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Including a timely EDITORIAL FEATURE PACKAGE entirely devoted to the theme . . .

Are You Paying for Equipment You Don't Have?

- • • A discussion: When (from the foundryman's standpoint) is the time to replace old equipment in the interest of cost savings and how is this done?
- • • Ideas and suggestions on good replacement policy and practice (from the equipment-maker's viewpoint).
- • • Case histories citing dollar savings when new equipment is installed by foundries to replace obsolete facilities as well as old, worn-out equipment.
- • • An engineering analysis into all phases of one foundry's operations with a description of how changes will pay for themselves in a short period of time by cutting production costs.

* . . . . . to be distributed to more foundrymen than any issue in our 66 years of serving the industry: Over 20,000 copies! Issue will be mailed April 30, 1958 and distributed at the Cleveland AFS Castings Congress and Foundry Show, May 19-23.

- Pictorial review of new and improved foundry equipment to be seen at this year's Show.
- Convention Program and highlights of the meeting.
- Medal Award Winners.

Feature Stories and Regular Departments

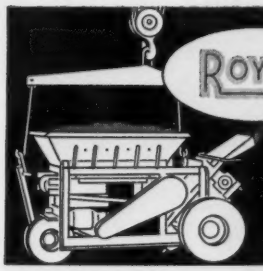
Late News insert, Questions and Answers, selected feature stories on technical foundry subjects and regular departments will appear as usual.

AMERICAN FOUNDRYMEN'S SOCIETY
Castings Congress and Foundry Show
Cleveland Public Auditorium
May 19 to 23, 1958

Coming in July—FOUNDRY's Annual Post-Convention issue . . .

The news and technical story of the Cleveland convention and technical sessions will be special features of the July Post-Convention issue of FOUNDRY

FOUNDRY A PENTON PUBLICATION • PENTON BUILDING • CLEVELAND 13, OHIO



SAND CONDITIONING TOPICS

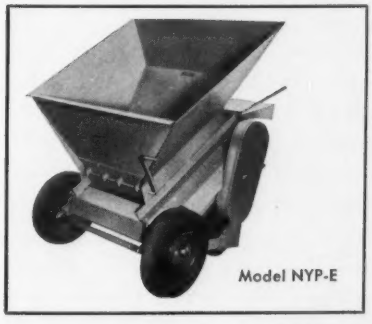
PUBLISHED BY **ROYER**, MANUFACTURERS OF THE FOREMOST IN SAND CONDITIONING EQUIPMENT

AERATE AND FLUFF AT MOLDING STATION FOR MAXIMUM BENEFITS

To take full advantage of the economies of central sand conditioning, highly mechanized foundries usually find it necessary to sacrifice other elements. Some of these are permeability, flowability and cooled sand.

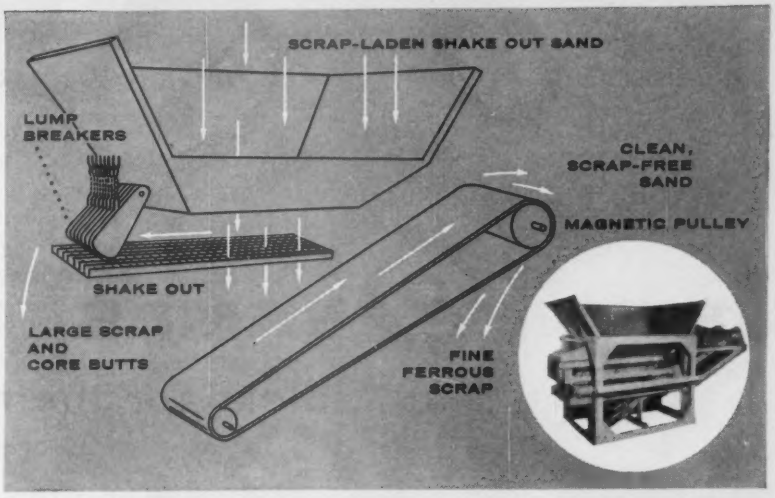
To produce the best possible molds, sand should be aerated and fluffed as the final operation before it is used. More and more, foundries with central systems are turning to Royer to help improve their sand's properties.

Thousands of foundries have increased the permeability of their molding sand 10 to 20 points by aerating at the molding station with a Royer Separator and Blender, like the Model NYP-E shown here. Besides eliminating the problems of packed sand, they gain the advantages of better flowability and cooled sand. Royerizing reduces new sand requirements and often eliminates entirely the need for facing sand. Castings have smoother finishes, too, reducing grinding and cleaning costs.


Model NYP-E

Royer Sand Separators and Blenders are available in sizes to fit any foundry need. This Model NYP-E handles the charge of a front-end loader. Other models are available with capacities as low as seven tons per hour.

Two bulletins describe the Royer line of Sand Separators and Blenders. Bulletin SS-54 covers machines from 7 to 60 tons per hour maximum capacities. Bulletin NY-54 describes the series engineered for high capacity sand handling systems. Write for your copy today.



Sand Contamination Drains Your Profits

Periodic business recessions in the foundry industry point up the need to eliminate waste and excessive hand labor—or sacrifice profits. In one area of foundry operation—sand contamination — important strides have been made in stopping the profit drainage.

Tramp iron damage usually occurs at the muller, conveyor belts, aerator or patterns. Patterns faced with contaminated sand produce poor casting finishes and high scrap loss. Probably the most efficient and economical way to remove contamination and produce clean sand is with a Royer Scrap Control Unit.

Referring to the drawing, shake out sand from the molding floor is dumped by front-end loader into the receiving hopper. Large scrap is riddled out by the Shake-Out and discharged at convenient wheelbarrow height for collection and removal.

Ferrous scrap small enough to pass through the grid openings of the Shake-Out is separated from the sand by a magnetic pulley at the upper end of the conveyor belt. Depending upon the degree of mechanization you employ, clean sand discharge may be made to a skip hoist feeding a muller, conveyor belt, or into the hopper of a Stationary Royer Separator and Blender for cooling, aeration and blending. We recommend discharge onto a heap for transporting by front-end loader to a Portable Royer Separator and Blender at the molding station for cooling, aerating and fluffing.

If tramp iron is the cause of any of your profit loss, we invite you to discuss your problem with the foundry-wise Royer agent serving your territory. He'll explain how a Royer Scrap Control Unit can pay for itself in less than two years, stop your profit drainage and improve the quality of your castings.

Your first step in stopping profit drainage caused by sand contamination is to mail the coupon for our latest Scrap Control Bulletin. We'll send it without obligation—plus the name of the agent who serves you.

ROYER FOUNDRY & MACHINE CO.

ROYER 159 PRINGLE STREET KINGSTON, PENNA.

Sand Contamination is cutting into our profits. Please rush me your Scrap Control Bulletin.

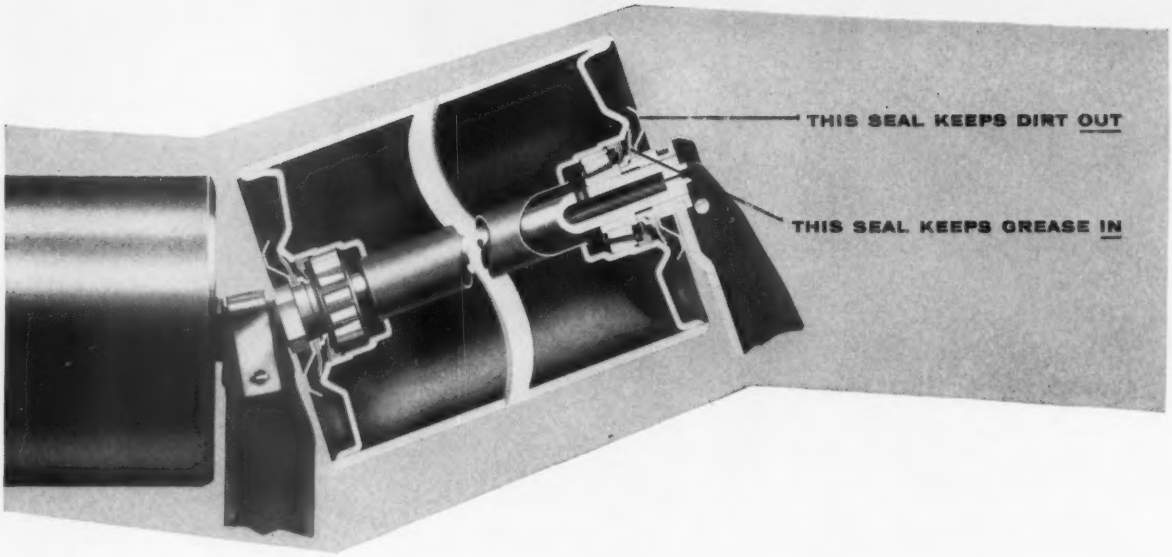
NAME_____

COMPANY_____

ADDRESS_____

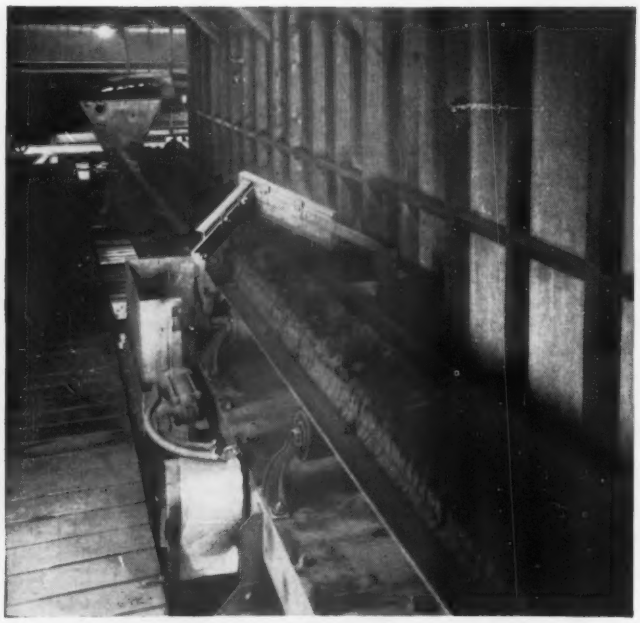
CITY_____ ZONE_____ STATE_____

Circle 607 on Page 51



JEFFREY PERMASEAL® IDLERS

The best built idlers for the toughest jobs



Belt conveyor equipped with Jeffrey PERMASEAL® Belt Idlers handling sand in a steel foundry.

Grease can't get out to foul conveyor belts; dirt can't get in to damage bearings. Diaphragm double seals protect both ends of every roller. That's why Jeffrey Permaseal idlers give extra-long service with an absolute minimum of maintenance.

Greater dependability and longer life offset the slightly higher initial cost for Permaseal idlers. Pay off quickly on the tough jobs. Pay off, too, through less downtime, fewer replacements and lower upkeep on all belt conveyors.

Your materials-handling supervisor should have the new Catalog 909, Jeffrey Belt Conveyors. It has valuable design and descriptive data on these products. For a copy, write The Jeffrey Manufacturing Company, 907 North Fourth Street, Columbus 16, Ohio.

CONVEYING · PROCESSING · MINING EQUIPMENT...
TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

JEFFREY

Faster · · · Easier · · · Lower Cost

Cupola Lining Repairs with GUNPATCH

for gun application

GUNPATCH is a special siliceous mix prepared for air gun repairs to the melting zone of the cupola. Extremely high grade quartz pebbles and sized quartz sands constitute the major part of this mix. Selected plastic fire clays and other bonding agents are used to induce the cementing action that firmly holds the quartz pebbles in place until the high temperatures of the operating cupola develop the necessary ceramic bond that welds the applied mass into a strong, dense lining. Foundry operators report less rebound loss in application and less burn-out even in extremely high tonnage melting operations. GUNPATCH can be used with all types of standard gun equipment. It is shipped bulk or in 100 pound multiwall bags.

DAUBPAX for foundries not equipped with pneumatic guns

DAUBPAX . . . one refractory for every foundry refractory requirement . . . a complete foundry maintenance material. DAUBPAX is a superior bonded quartz ramming mix. It is a silica-base plastic material shipped in 100 pound cartons ready for immediate use. In addition to being excellent for patching cupola walls, DAUBPAX may be rammed into the bottoms and side walls of receiving and pouring ladles to form patches or complete linings. DAUBPAX is also available in dry form for mixing on the job. Shipped in 100 pound bags.

For further information and prices, just write our Sales Office at the

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Circle 648 on Page 51

PYRO LANCE

get below surface readings for greater accuracy

Temperature readings of molten nonferrous metals are only accurate when taken below the surface, unaffected by dross and other surface conditions. That is why there is industry-wide acceptance of the Alnor Pyro Lance.

Portable, handy to use, the Alnor Pyro Lance has a protected thermocouple mounted in the lance tip. Enclosed couple is protected against flame, fumes and corrosion, assuring long, accurate service under severe conditions.

Pyro Lance models are available for a wide variety of metals and foundry operations. Write today for Bulletin 1724-D and see how you can have low-cost quality control in your foundry. Illinois Testing Laboratories, Inc., Room 511, 420 North LaSalle St., Chicago 10, Illinois.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Circle 610 on Page 51

Readers' Comment

Fluxes for Tin Bronze

To The Editors:

I have read with much interest the series of articles by Clyde L. Frear on the subject of "Shrinkage in Tin Bronze" and I should like to offer one or two comments on Mr. Frear's discussion of the use of fluxes and covers.

Fluxes may be divided into three groups: (a) oxidizing fluxes; (b) neutral fluxes; and (c) reducing fluxes. Mr. Frear discusses fluxes of each of these groups separately but I do not feel that in his otherwise excellent series of articles, he does full justice, either to the oxidizing or reducing fluxes.

Mr. Frear states it is necessary for an oxidizing flux to form a continuous layer on the surface of the metal bath and he, therefore, suggests that such fluxes are virtually useless in reverberatory and other furnaces where the force of the flame prevents complete coverage of the metal by the flux. The idea that an oxidizing flux must completely cover the bath is surely wrong and based on a misconception of the method of operation.

The purpose of using oxidizing fluxes is, of course, to introduce oxygen into the melt, and they will do this quickly and effectively whether or not the flux layer completely covers the surface of the melt. Once the oxygen has been introduced, the melt is unable to absorb more than a very small trace of hydrogen, and it matters not at all whether hydrogen or water vapor has access to the metal surface.

This theory of the action of oxidizing fluxes is well established and is based on the pioneer work of Allen and Hewitt,[1] Baker and his associates,[2] Pell-Walpole,[3] and others.

Mr. Frear, on the other hand, appears to assume that the only way in which an oxidizing flux operates is that it prevents hydrogen from getting into the metal by reacting with the hydrogen in the *flux layer* to form steam which passes away harmlessly. It is true, of course, that hydrogen trying to pass through the flux layer would so react, but the point I want to emphasize is that hydrogen having direct access to the melt surface or passing through the crucible walls is also unable to enter the metal once the flux has raised the oxygen content of the latter to a suitably high value. I do not therefore consider that Mr. Frear is correct in saying that oxidizing fluxes have no value in preventing hydrogen pickup through the crucible walls or from a damp furnace lining and that these fluxes do not prevent gas pickup in reverberatory type furnaces.

I also do not quite agree with Mr. Frear when he states that neutral, glassy fluxes should never be used when oxidizing materials are added to the charge since such fluxes may prevent removal of the oxidized gases from the melt. If an oxidizing agent is added to a melt containing a substantial amount of dissolved hydrogen, the latter element will be expelled in the form of steam bubbles which, in view of the pressure generated, will undoubtedly be able to force their way through a glassy flux unless it is of exceptionally high viscosity.

Turning now to the use of reducing covers, such as charcoal, I entirely agree with Mr. Frear in his view that they do not prevent hydrogen from being absorbed by the melt. But I think he greatly overstates the case when he says that such covers are one of the most dangerous substances which can be added to a bronze melt. As has been repeatedly demonstrated by many authors—one might cite Baker[2] as an example—reducing covers are extremely valuable, provided the melt is subsequently treated for the removal of the hydrogen by flushing with nitrogen or other means, because of their ability to keep the melting losses to a very low value. The advantages of reducing covers from the metal loss viewpoint has been shown by Jackson and Brown.[4]

In view of the fact that in many foundries the melting loss constitutes more than half the cost of melting, the economic advantage accruing from the use of such covers is, in fact, very substantial although this must, of course, be weighed against the nuisance value of having to perform subsequent degassing.

R. W. Ruddle
Technical Manager
Foundry Services, Inc.
Columbus 7, Ohio

References

1. N. P. Allen and T. Hewitt, *Journal*, Institute of Metals, 1933, Vol. 50, p. 257.
2. W. A. Baker and F. C. Child, *Journal*, Institute of Metals, 1944, Vol. 70, p. 349.
3. D. Hanson and W. T. Pell-Walpole, *Chill Cast Tin Bronzes*, (London, 1951).
4. R. S. Jackson and D. W. Brown, *British Foundryman*, 1957, Vol. 50, p. 103.

SHELL MOLDERS:
More stable pattern sprays with
DOW CORNING 8 EMULSION
(SILICONE PARTING AGENT)

Even after long storage, Dow Corning 8 Emulsion parting agent still stays uniformly dispersed and ready for dilution when you need it.

This inherent resistance to separation and creaming will save you time and money . . . simplifies preparation of parting agent sprays. Many experienced shell molders premix several days' supply; gentle agitation keeps the silicone solution always ready for their instant use.

You can reduce production time to an absolute minimum and assure cleaner, easier release with water-dilutable Dow Corning 8 silicone emulsion.

8 reasons why . . .

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Circle 665 on Page 51

WHATEVER YOUR SHELL MOLDING REQUIREMENTS...

THESE SUCCESSFUL CASE HISTORIES
ARE ONLY TYPICAL . . .

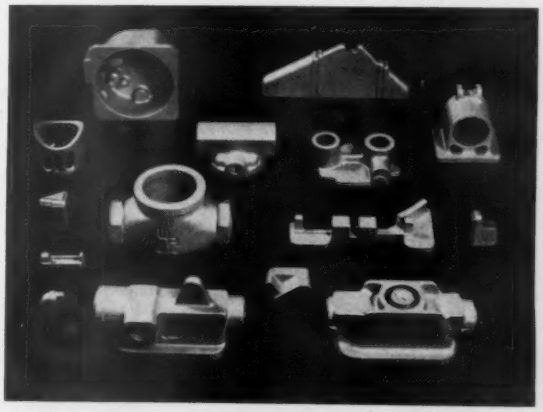
BAKELITE Brand Resins are used to make precision parts for automobile engines. This crankshaft is typical of many parts that are mass produced by mechanized shell molding techniques. Notice the smooth surfaces in spite of the fact that machining and grinding are held at a minimum. Estimates indicate that shell molding has cut these operations in half.

there's a BAKELITE Resin to do an excellent job

That's because Bakelite Company produces such a wide *variety* of fine quality resins for shell molding. You benefit by this greater selection because it makes it easier to find the formulation best fitted to your needs.

In addition, you can count on expert technical assistance. Bakelite Company was a pioneer manufacturer of shell molding resins in this country, and thus has a wealth of experience to put at your service. For information, call your BAKELITE representative or write Dept. CD-71.

This stainless steel casting was made by Pacific Alloy Engineering Corp., San Diego, Calif., in a shell mold made with BAKELITE Brand Phenolic Resin. The thirteen-inch diameter was held to a tolerance of ± .015 inches, and the finish was 125 RMS or better. During production, 3,089 castings were made without a single reject.



Hutchinson Foundry Products Inc., Alton, Illinois, uses BAKELITE Brand Phenolic Resin to produce cost-cutting castings. These castings are only typical of the variety of shapes ...fine detail...smooth finish and close tolerances that result from BAKELITE Brand Resins for shell molds and cores.

It pays to formulate with

BAKELITE BRAND **PLASTICS**

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BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.

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Next time you need foundry flasks we invite you to investigate the many advantages of STERLING. For complete information please contact our representative . . . or write

STERLING WHEELBARROW COMPANY • Milwaukee 14, Wis. U.S.A.

Ten Years Ahead

Even in times of slow business consideration must be given to preparing for the vastly improved demand that surely will come. Adequately trained manpower is one of the important tools which will be needed to tap these future markets. As foundry operations become more mechanized, this manpower supply must include engineers and technicians if full benefits from these new machines are to be realized.

Since its organization 11 years ago, the Foundry Educational Foundation has brought the advantages of a career in the foundry industry to an ever increasing number of engineering undergraduates. Engineering schools in the FEF program have increased from 5 to 17, foundry laboratories in schools have been built or modernized, and more are contemplated. As a result of FEF progress, more engineers are joining the foundry industry.

Benefits also are developing in other directions. Increased attention to basic foundry research, greater interest in marketing castings, and the increasing complexity of modern business point to a need for men with advanced degrees in engineering and business administration. FEF now will expand into the field of graduate study through the grant of $100,000 by the Wheelabrator Foundation announced at the recent college-industry meeting. Fifty fellowships and other benefits to FEF are provided for in this generous grant.

Realizing the growing need for technicians in foundries, foundation trustees also have been studying the possibility of a program in 2-year technical institutes. An entirely new program with separate financing would be required.

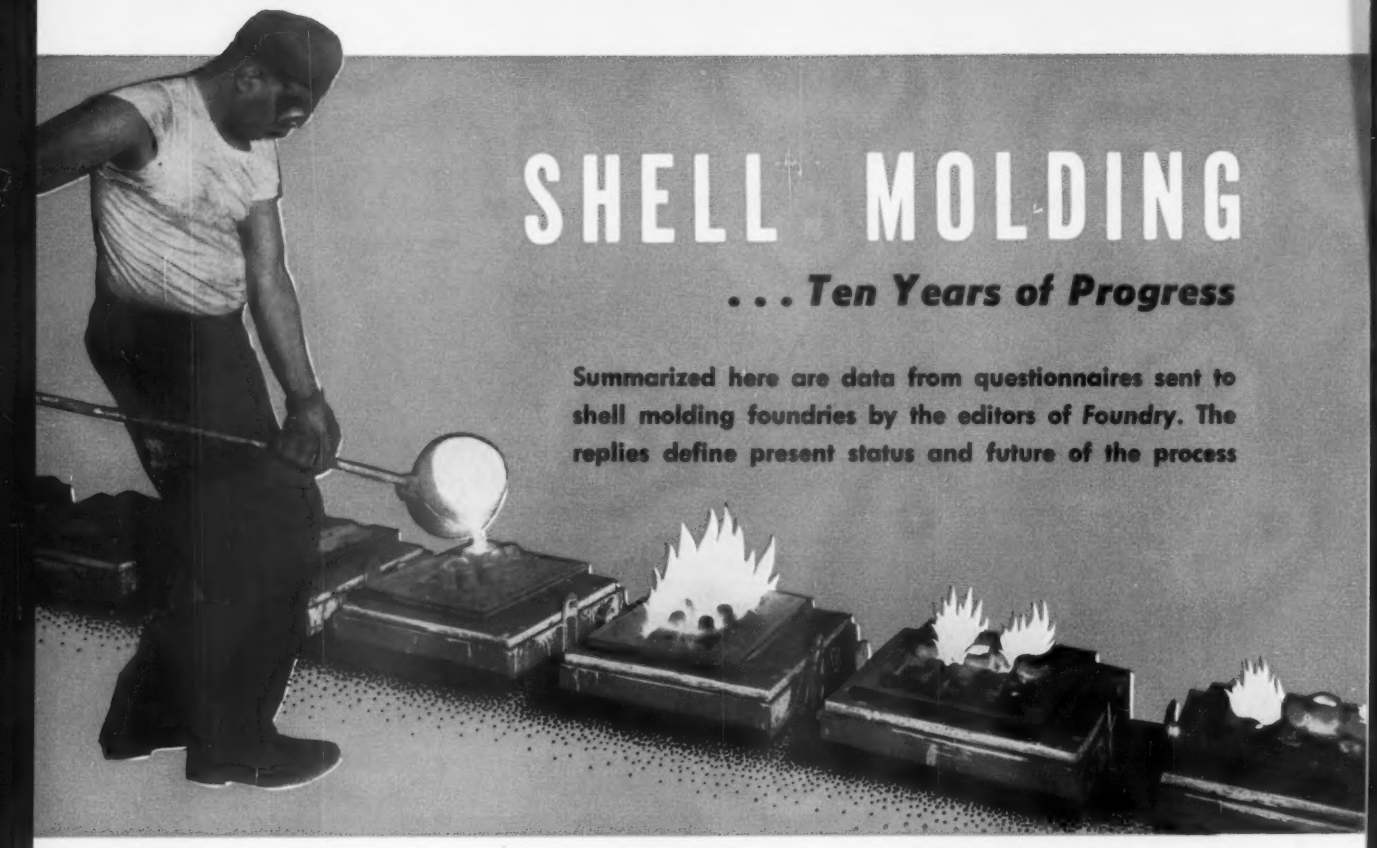
Spreading the gospel of castings as excellent engineering materials has been an important byproduct of the foundation program in its schools. With the aid of foundry trade associations, which also are doing a casting promotion job in engineering schools, this effort might be formalized and promoted.

The Foundry Educational Foundation program is growing. The new support for a special graduate program should suggest similar action to others. But the extent to which the undergraduate program can grow and increase in service depends on the continued support of present members and the extension of financing through the return of former members and the addition of new members.

As Dr. Clyde Williams said at the annual dinner, "The very existence of this Foundation is evidence that your industry is alert, that you recognize the challenge of the future, that you are serving your industry in a manner fitting to your great industry, one of the world's oldest and most respected. You have anticipated by ten years the action of many industries."

Let's keep up this advantage through FEF support.

Frank G. Steinebach
Editor



SHELL MOLDING

. . . Ten Years of Progress

Summarized here are data from questionnaires sent to shell molding foundries by the editors of *Foundry*. The replies define present status and future of the process

SHELL molding has come a long way since foundrymen first learned about the German-developed process ten years ago. But it still has a considerable distance to travel before it attains the degree of use predicted for it.

FOUNDRY's first article on shell molding, published in 1948, said that the process "may be an important advancement in the art of metal founding." That expectation has been confirmed by subsequent developments. Much has been learned about the method's advantages and limitations and about the practices, materials, and equipment which will make it most efficient as a foundry tool.

Some Problems Remain—Like many new techniques, shell molding has not proved to be the simple solution to all of the numerous problems faced by the foundryman in producing a high-quality casting. Nevertheless, the number of foundries which have adopted the process has grown steadily to more than 500 in this country. About 65 per cent of this number started commercial production after 1953.

Accompanying this growth has been an expanded use of resin-sand mixtures for the production of hollow cores; in fact, the prediction frequently is made that shell cores offer a greater opportunity for wide application and cost savings than shell molds.

To obtain a picture of where the shell molding process stands today, FOUNDRY recently queried foundries making shell molded castings about their production methods, opinions on future trends, and needs for new or improved materials and equipment. The study was concerned only with shell molds, rather than with both molds and cores.

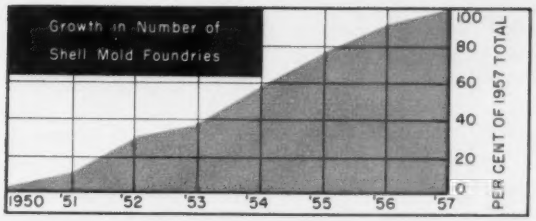
Production Grows—Replies to the questionnaire were received from a highly representative group of foundries which last year accounted for probably 90 per cent or more of all shell molded castings produced by the industry. Indicative of the growing use of shell molded castings is the fact that tonnage of castings produced by foundries represented in this study was 21 per cent larger in 1957 than in 1956. By contrast, 1957 production of castings produced by all molding methods was nearly 10 per cent less than in the year before.

Excluding the tonnage accounted for by the high-production automotive foundries, average output of reporting firms in 1957 was 470 tons, or 57 per cent more than in 1956. Because practically all of the foundries which did not participate in this study are small producers, average output per shop (excluding automotive foundries) actually was well below the 470-ton figure indicated above.

Although exact figures are not available for all shell mold foundries, it is estimated that the industry's total production last year was close to 225,000 tons of castings.

Relatively few foundries are 100 per cent shell mold shops. Nevertheless, the large majority of producers of both shell molded and other types of castings expect that shell castings will represent a growing share of their total output during the next few years.

Single copies of the shell molding series are available until supply has been exhausted. Check Reader's Service Card, Page 51



From the consensus of replies to the various questions asked in this study it is possible to arrive at a partial description of the "average" shell mold foundry. It is shown in the accompanying box.

Metal and Markets—Gray iron, aluminum, and brass and bronze are the principal metals cast in shell molds. Forty-five per cent of all shell mold foundries cast gray iron, with only slightly smaller percentages shown for aluminum and copper-base alloys. Percentages for other metals are as follows: High-alloy steel, 26 per cent; nodular iron, 15 per cent; malleable iron, 14 per cent; carbon and low-alloy steel, 13 per cent; and magnesium 5 per cent.

Shell molded castings are used by a wide variety of consumers. Foundries report that the industries they serve comprise a group comparable to the manufacturers consuming the largest tonnages of castings produced by other methods. Outstanding users are the automotive industry and builders of various types of machinery.

Sizes of Castings—Gray iron and brass castings are produced in weights ranging from an ounce or less to a reported maximum of 100 pounds. Largest sizes produced by most foundries weigh 10 to 20 pounds, although automotive castings of more than 50 pounds are cast in sizable number. Excluding the latter the average is 1 to 5 pounds.

Shell molded aluminum and magnesium castings tend toward lighter weights. They range from less than an ounce to 50 pounds, with the largest generally 5 to 10 pounds and the average 1 to 3 pounds.

Equipment Used—Dump boxes, the equipment originally used to produce shell molds, continue to be the most popular type. About 85 per cent of the molding units in use are indicated as being the dump type, and the remainder are the more recently introduced blowers. Gas heat is employed on 60 per cent of the dump boxes, although for all types electric heat is applied to 55 per cent of the units. Dump boxes and blowers are operated automatically in 53 per cent of the cases, manually in others.

In most instances—80 per cent—foundries use the same melting equipment for shell castings as for other types of castings they produce. Less than 25 per cent of the foundries have separate cleaning room facilities for shell molded castings.

Pouring Practice—Only 15 per cent of all shell mold foundries said they poured castings on a power conveyor. Horizontal positioning of the shell, in contrast to common practice of a few years ago, is used by 60 per cent of the foundries during pouring. Vertical positioning is practiced by 30 per cent, and 10 per cent do stack pouring.

No backing material is applied to the molds by 57 per cent of the foundries; 30 per cent use sand backing. Most of the others use shot, although in a few instances slag or gravel is employed. Common practice is to place the molds on loose sand on the floor or on trays. Occasionally a permanent holding fixture is used.

Molding Materials—Subangular is the most popular grain shape of molding sand; it is preferred by nearly one-half of all foundries. Round-grain shape is used by 28 per cent and angular by 23 per cent. Silica or bank sand predominates, but about 10 per cent of the foundries indicated use of zircon sand.

Grain fineness of sand used varies somewhat, averaging 100 to 120 AFS fineness. Only a few foundries use sand in the 75-100 range.

Most popular sand-resin mixture is a dry mix. It is used by 63 per cent of all shell mold foundries. Coated sand use is divided 27 per cent for cold coating and 10 per cent for hot coating. The foundries also indicated that 82 per cent use a dry resin and 18 per cent the liquid type.

Participants in this study reported a resin consumption last year for shell mold production of about 12 million pounds. Based on this figure and other sources of information, it appears that total resin use in 1957 for both shell molds and shell cores was 16 to 17 million pounds.

Silicone is the preferred mold release agent. It is used at 92 per cent of the foundries, with others employing a wax type.

Ninety per cent of the foundries do not attempt to reclaim their used sand. Most of those which do not discard it absorb the sand through their green sand systems.

Heat treatment of shell molded castings is practiced in some degree by 60 per cent of the foundries. This operation applies primarily to aluminum, malleable iron, and nodular iron shops.

Sales Arguments—Dimensional accuracy, surface

The Average Shell Mold Foundry:

PRODUCES gray iron, aluminum, and brass and bronze castings.
STARTED commercial production of shell molded castings within the last four years.
PRODUCES castings weighing from a few ounces to 20 pounds.
SELLS to one or more of approximately 45 major consuming industries.
EXPECTS shell molded products to make up a larger percentage of its total castings output by 1960.
OPERATES a dump box molding machine which may be either manual or automatic type and is likely to be gas heated.
USES the same melting equipment and cleaning equipment for both its shell molding and sand casting departments.
POURS its shell molds in a horizontal position without backing, and does not use a power mold conveyor.
USES a silica or bank sand having subangular grain shape and AFS fineness of 100 to 120. Molding material is a dry mix.
USES a silicone type mold release agent.
HEAT TREATS some or all of its aluminum castings.
DISCARDS its used shell molding sand.
PRODUCED 470 tons of shell molded castings in 1957, compared with 300 tons in 1956.

finish, and reduction of machining are given by shell mold foundries as the most important factors in winning preference for their product over other types of castings. In general, uniformly high quality castings, which result in the lowest end-product cost, are indicated as offering the greatest appeal to casting buyers.

Among other advantages which foundries say the shell molding process provides are these: Less skill required of labor; ability to store molds; reduced floor space requirements; high production rate; ability to make intricate castings of certain designs impossible to produce economicallly by other processes.

Foundrymen made other comments concerning their expectations and hopes for the future of shell molded castings. They are presented below.

SHELL MOLDING'S FUTURE... *As Seen by Foundrymen*

FOUNDRYMEN'S views concerning future trends in the production of shell molded castings vary considerably. The composite opinion of those in the industry, however, indicates that total production will increase.

As one foundryman puts it, "The trend will be to much higher production of shell molded castings because costly machining operations can be reduced or eliminated. Also, with increased efficiency in shell molding operations and reduced casting weight, prices can be equal to or less than conventional sand castings where high production quantities are involved."

Others were more specific about increased volume. For example: "We expect that 90 per cent of our production in 1958 will be in shell." Another expects an "upward trend in tonnage by 25 per cent per year for the next few years, followed by leveling off at three times present tonnage unless major new developments or lower costs come into the picture." One foundry operator said that "in ten years shell molded castings will replace 90 per cent of castings weighing from 0.01 to 300 lb now poured in green sand."

From Where Will The Increase Come?—There is some disagreement as to the source of the increased tonnage. A few foundry operators feel that the "increase will be evident particularly in captive foundries, with marginal jobbing foundries being forced to discontinue shell molding operations due to lack of mechanization and increased competition." Others disagree, saying, "Production will increase because more foundries will use the process."

There is considerable agreement, however, that more customers are demanding shell molded castings and that demand will increase as production and use of shell molded castings become more economical. The belief also was expressed that an increase in the size of castings made by shell molding will develop. One possible obstacle was cited: "Equipment is the limiting factor."

INCREASE FOR CERTAIN CASTINGS

Several foundrymen qualified their optimism concerning increased tonnage for shell molded castings by saying that such growth would be primarily in certain types of castings. "The process is not a cure-all for foundry problems but does have decided advantages in specific applications."

In pointing out some of those operations another foundryman commented: "Shell molding's greatest opportunity will be in intricate and problem castings difficult to make otherwise." Another said, "The trend will be toward castings that require excessive risers in green sand to obtain sound castings, toward parts hard to pour because of thin wall sections, and toward applications where dimensional accuracy alone will eliminate machining."

Concerning the trend of metals to be poured in shell molds, a foundry operator predicted "a marked increase in parts made of alloy steels and heat and corrosion-resistant alloys. I also anticipate additional use of shell molded nodular iron parts to replace current carbon steel forgings and fabrications when foundries get cost analysis programs in high gear." Another foundryman expressed the opinion that "unless the burnt-in sand condition of mild steel castings can be remedied, the future for steel castings does not look too promising."

COST IS IMPORTANT

Cost is an important factor in the minds of foundrymen whether they are optimistic or pessimistic. Those who look on the bright side believe that as use of the process grows, raw materials will be improved and prices lowered; equipment will become

Principal Markets for Shell Castings

- Air Conditioning Equipment
- Aircraft
- Automotive Parts
- Bearings
- Chemical Plant Equipment
- Dairy Equipment
- Dental Equipment
- Domestic Appliances
- Electrical Equipment
- Electronic Parts
- Farm Implements
- Fencing
- Firearms
- Gages
- Gears
- Hand Tools
- Hardware
- Industrial Trucks
- Laundry Equipment
- Logging Equipment
- Lubrication Systems
- Machine Tools
- Marine Equipment
- Meters
- Mining Machinery
- Nuclear Power Equipment
- Oil Refining Equipment
- Ordnance Items
- Outboard Motors
- Plumbing Fixtures
- Power Plant Equipment
- Power Shovels
- Printing Equipment
- Pumps
- Railroad Equipment
- Refrigeration Equipment
- Road Building Equipment
- Sports Goods
- Textile Machinery
- Tractors
- Valves and Fittings
- Vending Machines
- Tools and Dies
- Woodworking Machinery

more dependable and capable of higher production rates. This thought was expressed in the comment:

"We have great faith that suppliers of resin bonds will develop better resins, faster to work with and more economical. We believe that machine builders will develop equipment that is more dependable and has faster production cycles. The combination of better machines and resins will permit foundries to produce shell castings at a price more competitive with green sand castings, and many more jobs will be converted to the shell process that to date have not been possible because of cost factors."

A more cautious view is expressed by a foundryman who sees a poor balance between capital investment for shell molding equipment and castings output: "Invested capital for shell equipment will provide only about 50 per cent of the production of conventional equipment. This raises cost and limits flexibility. In our judgment, shell molded castings will be specified, but cost and selling price will be the controlling factors on volume production."

That opinion finds support in this comment: "From the sales point of view, shell molded castings will most likely be used for any application where the finished part can be made at less total cost, where better appearance is required, and where less weight and/or resultant superior performance is of primary importance consistent with reasonable cost."

EXPECT PROCESS DEVELOPMENTS

Many foundrymen believe that normal developments in the industry will increase applications of the shell molding process. A few of these developments are set forth in this comment:

"We anticipate continued penetration of the sand casting market by shell molded castings at a moderate rate. Some of this penetration will be achieved by cost reduction through sand reclamation, shell blowing, stack molding, and other developments."

The expectation that mold blowing will grow steadily with a consequent decrease in dump box operations was mentioned a number of times. Blown molds will have contoured backs for uniform mold thickness or the backs will be flat as required for stack molding.

Quality Control Will Improve—Also, it is believed that closer control of the process will develop as experience accumulates, with consequent reduction in production of defective castings. In the opinion of one man, "When scrap is over 15 per cent, costs are prohibitive. With scrap in the 2 to 4 per cent range the process becomes more attractive."

Several comments point to a desire for new materials and practical methods for short-run production. One man looks for "developments that will make short-run jobs in jobbing foundries practical." Another believes that "the future will bring development of lower temperature molding with consequent use of cheaper, easier worked pattern materials." A third anticipates that "present resins will be replaced with some type of inorganic bond."

All of the comments were not optimistic as typified by this foundryman: "Shell molding never will replace nor reduce machining of casting surfaces that formerly required machining."

An important factor in future growth of the process is the foundrymen's realization that they and their customers must learn more about advantages and limitations of the process. When foundry sales programs convey that information to designers, machine shop operators, and ultimate users of cast parts, the production of shell molded castings will be increased.

Typical of the above view is the comment: "In the future, production of shell molded castings will increase steadily as more manufacturing companies become familiar with the possibilities and limitations of the process. Engineers now are considering shell castings and are designing new parts to be made by the process."

Another foundryman comments that "product design will demand intricate, precise castings with greater strength-to-weight ratios. The consumer will demand lower costs for these better products. These pressures on the foundry industry will increase the potential for shell molded castings."

"We will see more studied selection of castings for the shell process. There will be greater conversion of forgings and weldments to shell castings."

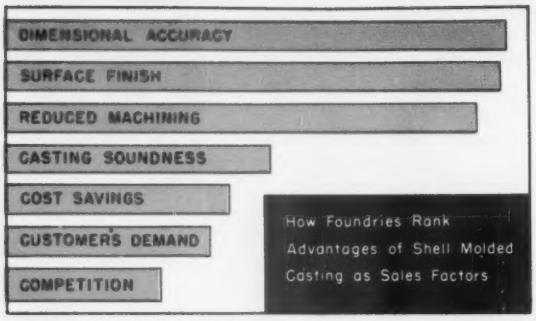
Some views also were expressed on the place of shell molding in the industry and the necessity for re-education on capabilities of the process. "I feel it will fill the void that exists between sand casting and diecasting. A great deal of re-education is necessary on the part of shell producers. The process was oversold at the start, so some people have had bad experiences."

What Foundrymen Want Of Material Suppliers

THE item of high resin cost was interwoven throughout the comments on what material suppliers might do to aid production of shell molded castings. Opinions were expressed on bettering service, improving currently available materials, and on the need for developing new materials.

How foundrymen feel about cost is fairly well summarized in the words of this operator: "If the shell molding process is to blossom into the bonanza that was predicted a few years ago, then the suppliers of molding resins must help us by finding new resins that will be faster to work with and cheaper to use. To date, every casting produced in our shop is sold at a premium price substantially higher than a comparable green sand casting. In the extremely competitive iron casting market this imposes a great burden on our sales department. When we are in a position to deliver shell castings at a figure more competitive with green sand castings, vast new markets will be opened. We hope material suppliers will help us in this effort."

Another man expresses confidence "that resin makers have been and will be of tremendous help



in their general education of customers as to shell molding's place in the foundry industry."

SERVICE CAN BE IMPROVED

Comments on service were rather evenly divided between pointing to the need for better trained representatives and suggesting desired technical help. One foundryman lamented representatives' lack of knowledge but lauded their good intentions: "Suppliers of sand and resin are not technically versed in the performance of their product and only can relate the experience of others. They go away with more information than they leave. As far as possible, they are extremely co-operative."

For technical help, foundrymen suggest: "Suppliers should do more field work, enabling them to know the foundries' problems and put their know-how to work correcting them."

"They can give more help with proper mixes for different casting applications."

"Resin manufacturers can standardize all tests for easier comparison by users."

HOW TO IMPROVE AVAILABLE MATERIALS

Foundrymen see a need for material suppliers to exert closer quality control to produce a more consistent product. This thought is expressed in the comment: "By being more consistent in the raw materials supplied for foundries, the supplier can eliminate one of the many variables the average foundryman is faced with daily."

Another sets forth the same opinion but couples it with mention of the need for lower prices: "Reduce prices, naturally. Exercise better control over specifications. Provide resins suitable for lower cost pattern materials. Develop lower cost patterns."

Another foundryman sees "not much hope for cost reduction on present materials, but better materials or better methods which would reduce the ratio of resin to sand would help."

The need was expressed in another comment that suppliers "further develop fast drying resins and release agents."

NEW MATERIALS MUST BE DEVELOPED

Many foundry operators set forth new developments they consider important for future growth of the shell molding process. The one mentioned most often was the need for more suppliers of coated sand or for development of satisfactory, inexpensive equipment to coat sands. Others see a need for generally improved resins and mixing processes; resins which will eliminate shell cracking, peel-back, and hot tearing of castings; better shell bonding agents, and improved release agents.

On the matter of coated sand, one foundry operator says: "We prefer to buy precoated sand. However, at present we can locate only one supplier of such sand. We feel that a supplier, set up to coat sands in large quantities, could do a more consistent job at less cost to us than we can coat our own sand."

Another, who prefers coated sands, feels that suppliers "could select and grade them for the various metals." Also, "usable coated sand should be supplied at a competitive price." Another man wants "a good coated zircon sand for steel."

Others, who would rather coat their own sand, want "resins that are easier to mix and inexpensive equipment for fast coating of sands." One man seeks a solution to the problem of "aerating coated sand after it is discharged from the mixer."

Want Generally Improved Resins—In commenting on the need for generally improved resins, this man offered a rather large order: "Resins should be improved to permit use of a lower percentage in sand mixes, to produce stronger shells, provide better casting surface finish, reduce gas formation, reduce odor and smoke, and eliminate the need for heat in curing." Many of these suggestions were made singly by other foundrymen.

Another man voiced the opinions of a number of foundrymen in his comment: "Suppliers should provide more uniform sand. All additions, including resin, accelerator, and wax, should be liquid. Alcohol solvents should be eliminated, and resins should be faster curing."

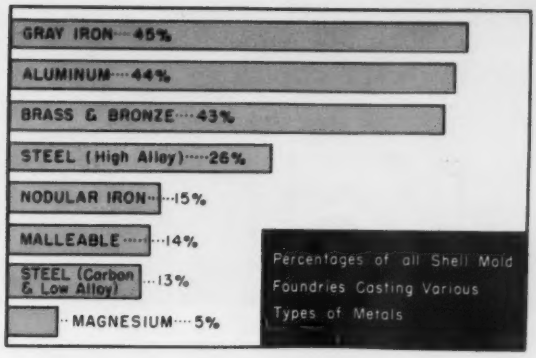
Foundrymen also want resin binders which will permit low-carbon and low-alloy steels to be cast without mold reaction." They also want resins with improved thermal shock resistance and resins which will reduce shell cracking, peel-back, and hot tearing of castings.

And finally, they want a better bonding agent or other method of joining shells. Also, they think suppliers should "develop better release agents to avoid build-up on patterns." One man would like a release agent incorporated into a dry mix resin.

How Equipment Builders Can Help Foundrymen

IN DIRECTING suggestions to equipment suppliers on how they can aid shell mold production, foundrymen commented chiefly on 1) service offered by equipment manufacturers, 2) the dependability of shell molding machinery, 3) how the machinery can be improved, and 4) on the need for reducing costs of machines and patterns.

Comments on service rendered were both favorable ("Equipment and supply vendors have, in our opinion, been very helpful in solving development


GRAY IRON 45%
ALUMINUM 44%
BRASS & BRONZE 43%
STEEL (High Alloy) 26%
NODULAR IRON 15%
MALLEABLE 14%
STEEL (Carbon & Low Alloy) 13%
MAGNESIUM 5%
Percentages of all Shell Mold Foundries Casting Various Types of Metals

and production problems") and unfavorable ("We have yet to meet an equipment or material supplier who knows anything about the process.")

A few specific suggestions were that equipment suppliers "be realistic in their appraisals of production estimates when considering capabilities of their equipment." In other words: "Soft-pedal their equipment claims." Also, it was said that "equipment suppliers are looking after new customers and neglecting foundries already using shell molding equipment."

Several foundry operators suggested that manufacturers "train their service and sales people to a better understanding of shell molding problems."

DEPENDABLE MACHINES ARE NEEDED

Foundrymen agree almost 100 per cent that shell molding machines currently available are unnecessarily complicated and lack the dependability required of production equipment. For instance:

"Equipment of necessity must be automatic and capable of high production. Such machines must be able to function three shifts a day five days a week without downtime or with not more than 5 per cent downtime. Trouble shooting by maintenance personnel must be fast. Time could be saved if machines had special circuits that would indicate the point of trouble automatically. The contacts of relays and other electrical equipment should be sealed against dirt."

"Keep the equipment simple and practical. We need mechanical, cam-operated machines for foolproof operation. Electronic devices, such as limit switches and electronic solenoids, on current machines give trouble and cause excessive downtime."

Another foundry operator admonished manufacturers to "engineer the machines properly to eliminate the necessity for rebuilding them after they are installed." Along the same line another man suggested that suppliers "be more practical and fully understand that the machines they are building now are beyond the experimental stage and that foundries want to buy a usable production tool."

SUGGEST MACHINE IMPROVEMENTS

Foundry operators have many ideas concerning equipment improvements they believe are needed for a shell mold foundry. Generally they would like more rugged, dependable equipment. Specifically, they mentioned increased automation, particularly for small-scale machines; reclamation units for resin-bonded sand; mold clamping fixtures and special conveyors to hold molds during pouring; a method for heating patterns uniformly and automatic control of heat; improved patterns with standardization on types and sizes, and fast changing of patterns.

This last point, judging from the number of comments, is uppermost in the minds of many foundrymen. This comment was typical: "Find faster ways of mounting and changing patterns so that the shell molding process can be used for quite small runs."

Another foundry operator had this to say concerning ruggedness of equipment and pattern heating: "Equipment suppliers can improve pattern preheating and the method of replacing lost heat after investment to avoid downtime to reheat sprues and high points on patterns. Stripping cylinders, wiring, hydraulic systems and other parts of equipment can be heavied up or improved."

Standard Size Patterns Are Needed—A number of foundrymen would like to have pattern sizes standardized so that patterns can be used on different makes of machines.

The subject of automation also brought forth several opinions:

"Develop the punched card or tape system of automatic process for foundry applications."

"Investigate the 'building block' idea in automation to reduce initial cost and standardize specifications."

"Equipment suppliers should design serviceable, automated, small-scale equipment."

In the line of pouring aids to improve casting quality, one man would like "clamps, presses, or machines that will help produce a casting of definitely predictable dimensions across the parting with no fin." Another wants a better method of bonding: "Bonding still is a primary cause of dirty castings."

The need for sand reclamation equipment was expressed by several foundry operators. The straight-to-the-point comment of this man is typical: "We need an effective, economical sand reclamation unit."

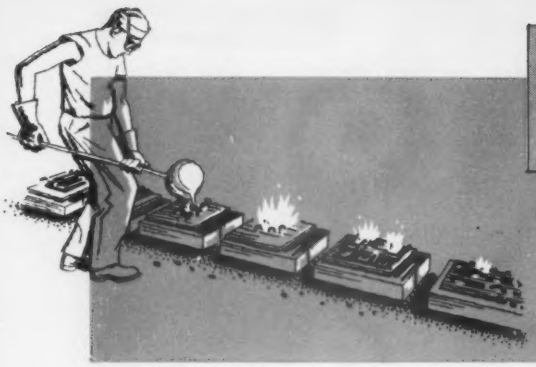
EQUIPMENT AND PATTERN COSTS MUST BE REDUCED

Generally there is a feeling among shell mold foundry operators that equipment and pattern costs are too high—"higher than for other types of production molding equipment."

One man feels that the initial investment for shell mold production is excessive: "That is the reason why smaller companies are not doing what could be done in shell molding." Another feels that in addition to the high cost of machines, "they are too limited in the size of pattern plates they can handle."

By way of cost comparison, a foundryman cites foreign equipment: "A German machine with freight paid to Chicago costs $2100 compared with a similar domestic machine which costs $7000.

The need for development for cheaper patterns was mentioned by several people. One man wrapped the thought up neatly by saying, "He who controls cheap, quickly made patterns, controls shell molding."



Suppliers Discuss Developments in RESINS and

Some improvement in resins seen by manufacturers, but possibilities of lower costs are not promising. Equipment builders plan to stress speed and ruggedness in future designs of machines

WHEN the first information on shell molding was published in this country in 1948, both the foundry and the chemical industries showed immediate interest. Foundrymen saw in this new process a means of producing castings with close tolerances, good surface finish, and possible lower cost for the final component, ready for use. Producers of resins saw the potential for enlarged markets. Before long, equipment producers also realized that a new field in foundry machinery was opening up.

In ten years, these three groups have done much to improve practices, develop new methods, and provide better materials and machines for producing shell molded castings. Much has been accomplished, as growth in the tonnage of castings produced by this method well illustrates.

Nevertheless, the desire for better methods, better materials, and better machines continues. As a part of FOUNDRY's study of shell molding, foundrymen were asked to comment on the most pressing needs in the matter of both resins and shell molding machines. Their interesting replies are presented elsewhere in this issue.

Since both resin manufacturers and builders of shell molding equipment have contributed much to the process, their ideas on what the foundry industry may expect in the way of supplies and equipment are pertinent. Therefore, the editors proposed four questions to each group, and the response has been most gratifying. These comments follow.

WHAT ABOUT NEW RESINS?

The first question asked producers of resins for shell molding was, "Do you believe that new or improved resins will be developed within a reasonable time which will help produce better shell molded castings?"

Companies responding are almost unanimous in the belief that improvements will come along in a reasonable time, but they do not agree as to extent and direction of these developments.

Progress to Date—One producer indicated possible future trends by describing progress during the last two years, as follows:

"We are sure that new and improved resins are being developed which will help produce better shell molded castings. Two years ago our production was one principal type of powdered resin for the foundry industry. At present, we are making a wide variety of foundry resins which include powdered, lump, liquid, alcohol soluble, water soluble, and various combinations. Each new resin must, of necessity, be an improvement over previous resins to be salable."

New Processes Needed—While improvements in resins will be made, the greatest field for progress in shell molded castings rests in the development of new processes, according to another company: "Greatest improvements will be in the realm of making easier-to-handle resins as well as those which can be used in lower concentrations, thus making it possible to produce shell molds at a lower cost. Chances for improving shell molded castings drastically fall in the area of developing new shell molding processes more than in the area of resin improvements alone. Of course, we constantly are attempting to develop and have available new resins which will fit the requirements of any new processes that are adopted. Improved processing methods as well as resin development work is carried on by our technical people."

It Must Pay Off—The fact that improved shell molding resins are a constant and continuing objective on the part of producers, and that this will continue, was stressed by another company. The proviso is added, however, that producers must obtain a reasonable return for their products which will allow them to spend the necessary research and development dollars. This organization continues:

"A higher level of development effort probably exists today than at any time since 1950. Development of successful coating resins and increasing interest in sand coating by foundries has added a new parameter to shell molding resin development. Coating can be done with powdered, solid, or liquid resins, and it can be done hot or cold. These six basic permutations can be subdivided further for specific applications. At present,

there is no single type of resin or technique favored by all major foundries which do coating.

"Most resin companies are devoting time to all techniques for the short-term picture, at least, and it is a large undertaking. Undoubtedly, further experience will indicate advantages of one process over another more clearly than can now be determined, and the number of techniques will be reduced. At such time, resin development will proceed on improving performance and efficiency of the resins. Continuing emphasis will be placed on cost reductions without sacrificing quality."

Foundry Practice Important—Although new and improved resins will be developed, "such resins will not *directly* help produce better shell molded castings," according to one producer. "The production of better castings is as much a function of the shell molding foundry practice as of the specific resin used."

After indicating that improvements in resins have been made constantly and that further improvements are certain, a supplier indicates, "In general, available resins are quite satisfactory when used properly, but new developments to meet individual requirements and processes should make shell molding more advantageous and economical."

Liquid Coating to the Fore—Nothing revolutionary but a continual general improvement is looked for by another company which says:

"The procedure of using powdered resin now is outdated in the larger foundries. The trend is to liquid coating resins and this is, in some respects, the same as noticed some years ago in the woodworking industry. The parallel proves that solids and powders are, by and large, bulky and too expensive to handle.

"In addition, from the resin producer's standpoint, production of a powdered material represents an extra step in manufacture and thereby raises the end cost of the product. We can envision the day when the great bulk of shell mold resin work is done with a liquid type of material, delivered in drums, tank trucks, or tank cars.

"While we have some years of background in the handling of shell mold process, there is still much to be learned about the reaction of resins in the presence of sand. Our job will be to isolate and define these reactions. We feel that much work must be done in the improvement of shell producing equipment.

"While the shell producing machines have been well engineered and apparently are keeping pace, in some instances, with large production, the mechanisms now used for the coating of sand still lag behind industry requirements. Perhaps one of the brightest of the new innovations was the introduction of a pug mill, which serves the purpose of pretreating the sand prior to its entry into conventional mulling equipment."

Improved Safety—The lone dissenter on developments within a reasonable time does see that "there is a good possibility of developing in the near future stable liquid resins containing little or no flammable solvents for producing coated sand. Such resins should minimize application problems as well as safety hazards."

CAN COSTS BE LOWERED?

The second question asked producers of resins was, "Do you see any possibility of reducing the cost of resins to foundrymen through development of new resins or new resin manufacturing processes?" The possibilities of such developments do not appear too promising.

Those responding were unanimous in the opinion that it would be difficult to reduce the price of resins. It was pointed out that "resins for shell molding presently are being sold at a very low price, and the possibility of any future reduction in price seems doubtful." This conclusion was emphasized further in the statement, "The present market is depressed and does not offer a fair return for the research and technical service which is necessary."

New Base Materials Needed—Stressing the difficulty in providing price reductions, another producer stated, "Raw materials are purchased at market price and processing is standardized throughout the industry. The only avenues of approach that might be taken in reducing the price of shell mold resins would be to seek out new base materials of a lower cost. This is being done at present by all suppliers."

Replacement of present resins was considered improbable by one producer, who stated, "Resin manufacturing knowhow for the type of products used by the foundry industry is already at such a high degree of advancement that little in the way of cost savings can be expected from new, more efficient processes.

"Although there is always the possibility that

some new type of resin can be developed other than the ones now found to be the most suitable for use in the foundry field, it does not seem likely that in the near future new substantially lower-cost resins will satisfactorily replace present ones. Current foundry resin prices, if anything, may be forced upward by the continually increasing costs of labor, raw materials, packaging, and transportation."

One Possibility—Possibility of major developments which could offset costs was not ruled out entirely. It was suggested that "there is a possibility that different types of resins will be developed which are less expensive. These are already available although they have not found any measurable market since foundrymen are standardized today on phenolic resins and generally have built the process about these."

A similar comment said, "Modifications of the base resins are a definite possibility in any cost reduction program. There always remains the definite possibility of the use of less expensive, totally different resins for both shell molds and cores."

Efficiency a Factor—Foundrymen may be able to help reduce costs through "improvements in resin efficiency—that is, making less resin do the same job. Faster mixing or coating, decreasing build-up and faster curing times will aid in effecting economies." Along this line, another supplier suggested that "the only real possibility of reducing resin costs to foundrymen, in our opinion, is by lowering the resin content of the shell molding mix through the use of coated sand."

CAN UNIFORMITY BE IMPROVED?

The third question directed toward resin producers was: "Will new developments or practices permit more uniform control of resins supplied foundrymen?"

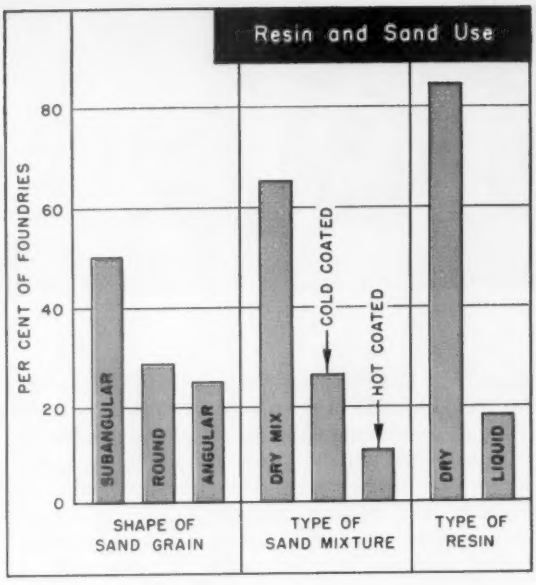
Opinion was scattered on the possibility of more uniform control. One comment was that "shell molding resins are very uniform in properties and it is doubtful if new developments or practices will improve appreciably the quality of those products."

Another firm stated, "Present batch size is in carload or tank car quantity for a single batch. These materials are made to very narrow specifications, so that uniform control of resins supplied to foundrymen is assured."

It also was stressed that "methods for exacting control of resin production are well established and there is no reason for foundrymen today to be purchasing resin binders that are not made according to individual specific specification."

A Tailor-Made Product—Developments in the control of resin production methods were outlined in the following:

"In the early days of shell molding, most resins were stock items off the shelf and originally were designed for incorporation as molding plastics, abrasive, and frictional resins. As knowhow was gained by both resin manufacturer and foundryman, a general tendency developed to 'tailor make' resins for specific foundry uses. Processes used in the manufacture of these materials have been standardized over several decades and no improvement is seen in the immediate future. However, familiarity with resins has increased to the point where greater quality control is now attainable. In addition, techniques in the use of equipment have provided greater uniformity in production.



"It might be added that in the past years profits on the sale of shell mold resins have dwindled to the point where they practically no longer exist. In spite of this, resin suppliers have continued to invest huge sums of money into research and development, realizing that the shell mold process is here to stay."

Better Control in Prospect—While one producer feels that no problem exists at present in regard to uniformity of resins supplied for shell molding, since these resins are produced with a great degree of uniformity, especially by those concerns with many years of experience in producing such resins, "efforts constantly are made to improve control and uniformity, and there should be definite progress along these lines in the future."

Trouble Lies Elsewhere—With resins now providing closely controlled properties, the suggestion was made that "variables in other components of shell molds or variables within the shell mold process itself are more likely to be troublemakers when difficulties are experienced in the production of shell molds. Day-to-day changes in grain size, clay content, or moisture content of the sand, as well as varying pattern temperatures or shell curing temperatures, can have a much more harmful effect on the performance of shell molds than any normal batch-to-batch resin property differences."

A similar comment points out "that experienced producers are controlling resins about as closely as possible. Co-operation of foundrymen in reporting performance characteristics to resin producers has aided materially in setting realistic manufacturing specifications for resins. One of the biggest troubles with some non-resin products or part-resin

products for shell molding has been their lack of uniformity compared to established phenolic resins. On the other hand, the new techniques being developed for coating sand with resins undoubtedly will allow much more uniform control of shell making and permit more efficient use of resins by the foundryman."

Foundry aspects of the control problem were mentioned further. "Resins are much more accurately controlled in production than in their use in the foundry. The problem is the variables encountered in sands, mixing procedures, heat of patterns, etc. There is room for a great deal of improvement in the uniform practice for using the resins."

WHAT OF THE FUTURE?

The fourth and final question directed to producers of resin was "What is your opinion of the future of shell molded castings?"

Further Gain Seen—All producers participating in the discussion agreed that the future of the shell molding process looks bright, and that the use of the process will continue to increase. It was emphasized, however, that shell molding has a definite field of application in which its advantages are very real, so that selection of castings to be made by the process must be done carefully.

"It has been found that shell molding is not a cure-all and that it is not suitable for every type and size of casting," is one comment. "When used for castings readily adapted to the method, it has definitely proved itself and shown many advantages. A large increase in the use of shell molds and shell cores can definitely be expected over the next few years."

Production Volume Governs—High production is a governing factor in employing shell molding, in the opinion of another producer. Foundries producing automobile castings, plumbing goods, etc., are typical of those providing a field for the process. Application to the jobbing foundry may be much more limited.

The economic advantage of shell molding was considered by another: "Cost savings made possible through the use of shell molds or shell cores for an ever-increasing number of foundry jobs are becoming more apparent each day as more experience is gained and technological advancements are made in shell producing methods. While shell molding is not suitable for all foundry jobs, it certainly does offer benefits in very significant portions of foundry activities."

Use To Triple by 1962—Emphasis on lower cost production was further emphasized: "All large production foundries will change to the shell molding process for producing molds and cores. It has been proved by such foundries that the shell molding process is more economical than the conventional methods for producing finished castings. Use of the process by the smaller jobbing foundries probably will be somewhat limited because of the higher costs for producing suitable pattern plates and coreboxes. We estimate the consumption of shell molding resins by 1962 will be about three times the present volume."

Coremaking a Big Field—While this study did not include the resins in coremaking, some producers see it closely tied in to the shell molding field. It was pointed out that "the future of shell molded castings lies to a greater degree in shell coremaking rather than shell molding. Use of resins for coremaking should be as great as that for molding within the next five years."

Growth in the use of the shell, both as molds and as cores, was outlined in the following: "Tonnage of shell molded castings should triple in the next five years and increase five fold in the next ten years. We would qualify this somewhat by calling a shell molded casting any casting that is made in a shell mold or with shell cores. It is difficult to make a sharp distinction between the two and it is possible that the use of shell cores may raise these estimates significantly.

"Shell molding reached one plateau in the last two years through the development of dependable dump box machines. It is now starting to climb to a much higher level through the development of dependable shell blowing machines and new coating resins. Continued growth, not only in our economy, but in the increasing number of shell molding applications will swell the market."

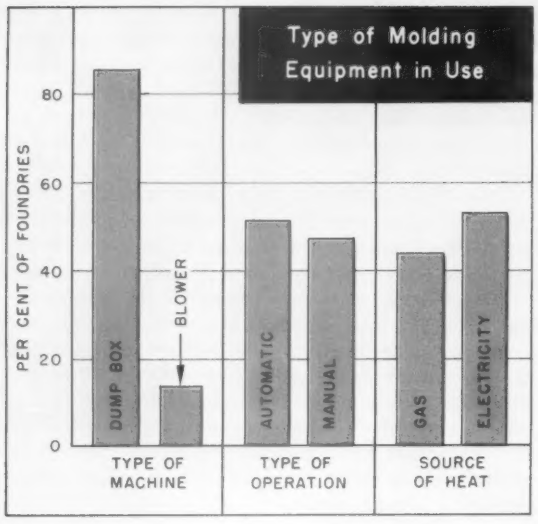
Future Trends in Design of Shell Molding Equipment

MANUFACTURERS of shell molding equipment first were asked, "In your opinion, what will be the future trends in shell molding equipment? Do you think future machines will be faster, simpler, sturdier, more flexible, or cheaper?"

Most replies said that future machines will be faster and sturdier. Some disagreement appears regarding simplicity, flexibility, and cost. In commenting on future developments, many producers discussed both shell molding and shell core equipment.

Two Types of Machines—Two trends in shell molding and core equipment were suggested by one manufacturer as follows: "The future machines should be faster, simpler, sturdier, and more flexible, if possible. One trend will be to the highly automatic, multiple-station machine for maximum production with minimum labor, utilizing one operator simply to remove the shell mold or shell core. This type of machine definitely is indicated for the high-production, automotive type foundries.

In the not-so-high-production foundries (farm equipment shops, for instance) there is a trend toward the single or two-station machine with one



operator serving two or possibly more machines. Whether single, two-station, or multiple-station machines are indicated, as much automation as possible is being requested. Therefore, the day of the cheap, low-production, high-maintenance machine is rapidly coming to an end."

Pointing out that shell molding is nothing more than a new tool for use of present and new foundries where quality of product is to be improved and where a reduction of manpower and fringe costs are vital for survival, another equipment producer indicated: "Of course the machines should be sturdy. They will be flexible to only a degree since the making of a hollow core, for example, demands an entirely different approach than a solid core. Molds needing no backing certainly can be made on different types of machines than those being made for shot, plate or contour backups. Probably the widest variation in shell machine design will be between a dump box machine and one that will blow shells directly onto a formed backup. Stepped up usage will govern this point and help operators to choose the machine most proper for their requirements.

"Answer to cheapness might be—cheaper than what? If the machine or machines amortize themselves quickly, then cost is a relative matter. It is a fact that shell making machines today can be purchased from $1000 to $75,000. Certainly these machines are to be used for entirely different purposes but still fit the need of the purchaser."

Need for Ruggedness Increasing—Design should give attention to factors of simplicity, sturdiness, and flexibility, as this comment points out: "With the increase in the size of castings being made in shell, sturdiness and ruggedness will have to be stressed. Foundrymen are noted for making a machine perform up to 200 per cent capacity. Flexibility, particularly in pattern change time, will make the process more adaptable for jobbing operations. Production is always a factor. Everyone wants to outproduce his competition. Speed of production should not be a major factor in the future development or growth of the process however. Manufacturers are striving to reduce prices. As competition becomes more of a factor, this will be increasingly necessary. A wider use of shell equipment and a corresponding increase in sales volume of equipment should make price reductions possible."

Speed Limit Reached—Machines available today are as fast as is possible, using existing resins, in the opinion of another equipment manufacturer. He points out: "Main governing factor in speed of machine operation is the time required to cure the shell properly. Higher output per machine can be attained in automotive production by using multiple-station machines. The equipment, however, is costly and confined solely to the very high production field. Machines will not be simpler since the first method of making a shell involved the simplest device—namely, the hand operated dump box.

"Present machines are sufficiently sturdy in design, or at least those of the more reputable manufacturers are in that class. Little opportunity for increasing flexibility is seen and, in the future, such equipment will be more expensive but will, in any case, follow the general trend of prices since the field is already highly competitive and the machines cannot be simplified to any degree unless there is a major change in the basic method."

Because high production will require that machines be sturdier, more flexible and versatile, but not necessarily cheaper, it was suggested that the "trend may be toward automatic single-station units, whereby a battery of such machines will form a molding line or a core production line. This system, of course, is flexible and makes for a smoother flow in production. Machines will be completely automated with only supervision and maintenance necessary. Operators, or labor, must be kept at a minimum to compete with multi-station units. Successful techniques developed in coating sands with resins used in shell molding are the determining factors in the type of equipment that will be used. The definite trend will be coating machinery for sand mixtures, and blowing machines for shell cores and molds."

Shell Mold Liners—Use of a shell mold as a liner was suggested in the following comment:

"Coated sand will be blown into special flasks or boxes. These flasks will be booked together, similar to mold dies used in permanent mold foundries. The closed box, with a shell liner, is poured. Upon opening, the casting is removed, the burnt shell liner falls out, and the flask is returned to the blow station for another liner. This method is similar to permanent molding techniques except that a liner is used. Such a method probably could be a turn-table affair where molds are blown, poured, shaken out, and returned to the blow station. Yield of castings per manhour and floor space is high and castings may be cheaper than conventional molding methods."

Faster and Cheaper—To broaden the market for shell molded castings, equipment must produce good castings faster and cheaper, in the opinion of a producer of patterns. "Shell castings are more costly than green sand at the moment, due to the comparative newness of the process and some problems that have not been mastered. There will be an increasing demand for shell molded castings that can be sold at an increased price provided the quality and accuracy will offset machining costs."

If the demand for shell molded castings is to grow, one equipment manufacturer believes greater interest must be stimulated in making patterns more economically: "Patterns and coreboxes are too costly. It is up to the pattern industry to come up with better patterns and coreboxes at prices more conducive to using such boxes in the shell process. Not to be overlooked would be special plastic patterns or material other than metal that is castable and will provide for close tolerances and smooth surfaces. Usage of special glass patterns is a possibility."

HOW TO IMPROVE SAND HANDLING

The second question asked equipment builders was, "Do you see improvements in methods of handling sand to the pattern?"

Better methods of handling and the use of coated sands appear to be solving the problem of segregation. Present trends show that "In the larger shops, systems are being installed to convey sand to the machine and molds away. Smaller shops still will depend on manpower. Segregation of sand and resin is being reduced much by the use of coated sands. As the quality of resins increases, more shops will start using coated sands."

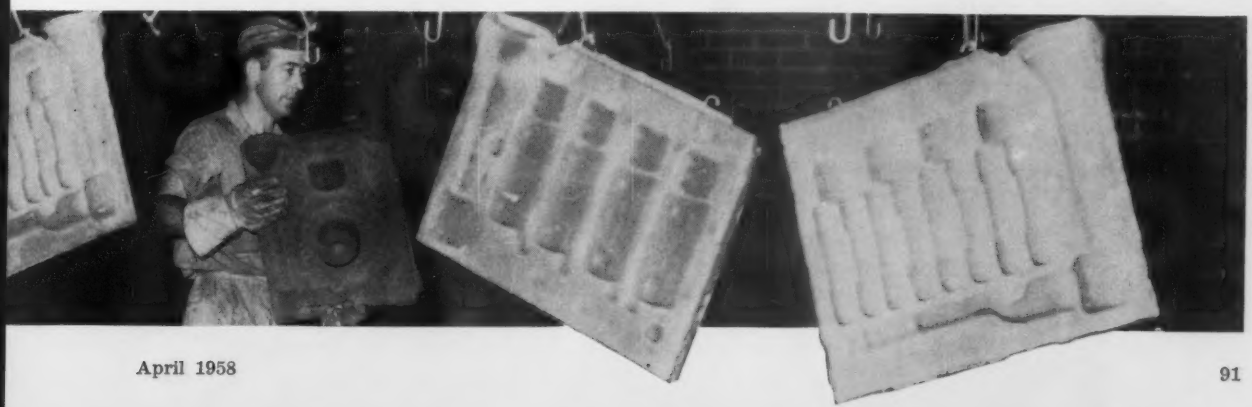
A similar comment reports: "Improvements in the methods of handling sand to the pattern are being made constantly. The problem of segregation practically is eliminated with coated sands by the use of proper base sands, proper resins, and proper sand coating methods and equipment."

Discussing the handling of the sand and resin within the machine itself, it was pointed out that "Several methods have been used or proposed to coat the pattern. To date our methods have been based entirely on blowing the sand to form the shell between the pattern and a back-up form. This method, however, is more suitable for the higher production operations. Resin-coated sands are used on all of our installations, and this largely solves the problem of segregation which is present when the sand and powdered resin are mixed together in the dry state."

Segregation Overcome—Progress that has been made in solving the segregation problem was emphasized in the following: "We have convinced ourselves that this is a minor problem and that the knowhow of today's shell molding equipment engineers has solved the previous and admitted problems of handling shell sand. Proper sand coating methods have done much to further this end, besides eliminating, to a large degree, the segregation and dusting problems of former days.

"No question was asked about sand coating. This is probably the one aspect of shell making that will see and can stand the greatest amount of future improvement and development. We can add that much progress has been made on equipment design to improve sand coating, and the future will add knowhow to this important subject at an accelerated rate."

The suggestion was made that improvements in methods of handling sand to the pattern will evolve from improvements in sand and resin technology. "Segregation in the small shop preparing dry resin mixes is a problem, but shell mulling units now are coating sand where no segregation problem exists. The trend will be to better resins which will make it easier to coat the sand in conventional mixing equipment. We understand that at least two resin manufacturers will be exhibiting new



resins at the AFS Foundry Show which will be easier to handle in conventional mixing equipment and thus will reduce equipment investment. Coated sands have or will eliminate any segregation which previously existed with dry resin sand formations."

Pneumatic Conveying—It also was pointed out that improved methods of handling sand to the pattern call for blowing coated sand. Such sand also can be conveyed pneumatically to the shell blowing machine. "Today's coating processes lend themselves to continuous batching operations. Such methods, when further perfected, will minimize sand handling operations, and will be performed automatically and continuously with a minimum of man-hours and equipment."

TRENDS IN SAND RECLAMATION

The third question asked was, "What will be the trends in shell molding sand reclamation?"

Replies indicate that work is being done on reclaiming equipment for shell mold sand, and that when the volume of sand reaches the point where reclamation is economical, equipment should become available. It was suggested that to date little sand reclamation is being done in production in relation to the total volume of sand being used.

Economic considerations were indicated in the following comment: "When proved cost savings can pay for a sand reclamation plant in from 2½ to 3 years, there is no reason for not planning one. This is particularly true since obsolescence is a minor factor in the type of equipment in question. Furthermore, with some type of castings expensive sands are needed which add to the basic reasoning for sand reclamation. One additional factor in favor of sand reclamation by the roasting process is that a portion of the heat in the sand can be utilized in the hot coating process with a further possible reduction of cost in the types of resin used."

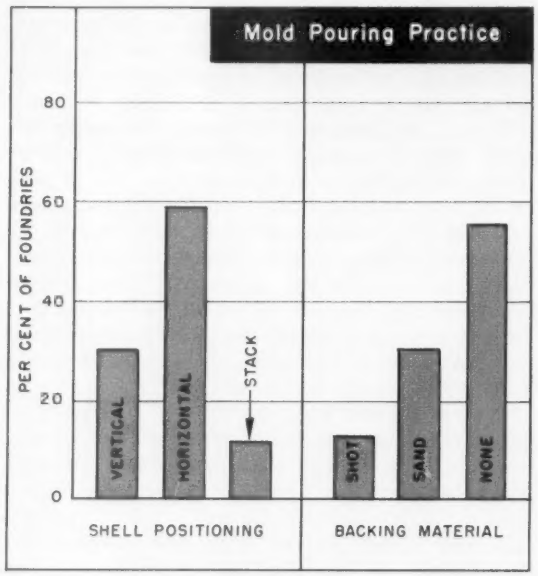
Savings Possible—The fact that reclaimed sand may have important values was indicated as follows: "Sand reclamation in itself has been proved over years of usage actually to improve sand quality. With resin this becomes an important factor since up to 25 per cent savings of bond can be made by the use of reclaimed sand."

The same theme was presented in the comment from another manufacturer: "Recent experiments indicate excellent results in the dry pneumatic reclamation of shell molding and shell core sand for continued reuse. Reclaimed sand shows an advantage over new sand because of a slight amount of residual resin coating filling the interstices and irregularities of the sand grain."

One comment points to production tests on reclaiming shell sand in a pneumatic reclaimer. While possible economically, "a problem arises because most foundries do not use sufficient sand volume in production to justify the necessary equipment."

Areas in which sand reclamation is being considered and would be practical include the following: "Areas where sand has to be hauled great distances, thus giving high freight costs; areas where refuse has to be hauled for great distances for disposal; shops having a large volume of refuse to haul out."

Reclaiming shell sand really is in its infancy, according to another producer of equipment. "In the shell process, especially in shell molding, only 1/20 as much sand is used compared with conventional green sand molding. In shell cores one-half to one-third as much is used as in conventional core practices. Therefore, sand reclaiming may not turn out to be as profitable as it may seem."



WHAT IS THE OUTLOOK?

The fourth and final question asked "What is your opinion of the future of shell molded castings?"

As will be seen in the following comments, enthusiasm for the process varies considerably. Most believe the greatest future for resin bonded sand is in the field of shell cores, at least for the present.

Cost was suggested as the possible limiting factor. "Unquestionably shell molding finally has taken a definite place as a method of producing castings. The main limiting factor on future developments will be the relative cost of the method. If properties of the castings so produced will not command a higher price, then obviously the foundry cannot afford to use the shell method of production. From the standpoint of the equipment manufacturer, the making of hollow shell cores presents a greater opportunity at present than the making of shell molds. In a great many cases, the making of hollow shell cores can be justified on a savings basis within the foundry itself without dependence on the customer paying more for

an improved product. In this field, of course, there is competition from the CO_2 process."

Pattern Size Grows—Machine builders cannot be anything but optimistic for the shell molding process, according to one comment, when pattern sizes in a relatively few years have grown from book size to 50 x 90 in. for cope and drag. "The foundry industry has a new tool in shell molding which should change some existing foundry processes with the following results: (a) Plant floor space can be reduced radically; (b) Plant labor, both productive and nonproductive, and plant equipment costs can be reduced; (c) Product quality can be increased. This is true, of course, in some cases more than in others. Much depends on whether the quality of castings has a direct bearing on the demands of present-day exacting limits required by automated machining operations.

"Gains already have been promised labor. We contend that a distinct process change is the only method to which management can turn to allow a larger return on his investment. Therefore, we look forward to increased enthusiasm toward the use of this modern tool by forward-thinking plant managers."

Spurs Other Developments—That shell molding is here to stay is emphasized in the following: "It is the best thing that has happened to the foundry in the last 50 years. In addition to being a good process, it has acted like a shot in the arm to foundrymen. Many foundrymen who do not accept shell molding today are improving their own methods, or coming up with better methods using their present equipment.

"Sands and their technology are being considered earnestly, metallurgy of metals is being supervised more carefully, and other conventional foundry methods are being scrutinized more closely. Castings are being made better and the foundry industry is again becoming alive and reclaiming some business lost to other methods."

The same idea was emphasized further in the following comment: "Shell molding and shell core processes have arrived. They are tools which, if used and applied properly, can recapture for the cast metals industry much that has been lost to weldments and fabrications. It is my opinion that 50 per cent of all foundries will be doing some shell work within the next 5 to 6 years."

While shell molded castings, especially small parts produced in high quantity requiring close tolerances and affording opportunity for savings because of reduced or eliminated machining operations, will find their place in the foundry industry, one participant in this discussion believes: "Shell cores will have a greater application than shell molds because they may be used in green sand, dry sand, or shell molds to advantage."

The idea that the future shell molded castings "will be used by the large production shops on long runs which will permit economical write-off of expensive patterns, sand handling, and mold handling equipment," was expressed by another manufacturer. At the same time, he believes that use of "shell molded cores will increase tremendously."

How 5 Foundries Use SHELL MOLDING

By ROBERT H. HERRMANN and JACK C. MISKE
Associate Editors

Albion Malleable Iron Co.
Bendix Aviation Corp.
Engineering Castings Inc.
M. A. Harrison Mfg. Co.
Midwest Foundry Co.

TO CONCLUDE their survey of shell molding, the editors of *Foundry* visited the five representative producers of shell molded castings listed above.

These foundries include high-production and small-scale operations. Metals cast include gray iron, steel, brass, and malleable iron.

Descriptions of facilities and methods at these shops are presented on the next ten pages.

SHELL MOLDING

Albion Malleable Iron Co.

• • • finds that shell molding can cut finishing costs and reduce dimensional variations. This foundry produces over 200 shells per hour for malleable iron castings

CUSTOMER satisfaction was the prime factor that motivated Albion Malleable Iron Co., Albion, Mich., to produce shell molded castings. Customers felt that finishing costs could be cut and that shell molding would reduce dimensional variations. These expectations have proved accurate, and Albion now is producing in excess of 200 shells per hour for ferritic or pearlitic malleable iron castings.

Sand is shipped to the foundry in bottom unloading closed gondola cars. It is stored in a 1200-ton capacity silo with the conventional arrangement to minimize segregation. Batch hoppers over each muller take off 720 lb of sand at a time and drop it into the mullers. For green sand mixes, these mullers have 3000-lb capacity each.

Sand Preparation—The sand mixture includes 720 lb of Vassar bank sand of 100 AFS fineness, 40 lb of liquid resin, 3¾ lb of hexamethylene tetramine, and 1 lb of calcium stearate. Additions are made through the door of the muller. The mix is mulled for eight minutes—four minutes while air heated to 400 to 500° F is circulated in the muller and four minutes more at ambient air temperature.

Coated sand at about 150° F drops from the muller onto a vibrating feeder, which discharges to a 2 x 6-ft vibrating screen having 16 holes to the linear inch. A 720-lb batch goes through this screen in 1.2 minutes, breaking up any lumps. From the screen, sand feeds into the suction end of a cyclone collector and is elevated 30 ft. It falls through a rotary airlock at the bottom of the cyclone into a 20-ton storage bin from which it feeds by gravity to hoppers over each of four molding units.

These machines are of the dump-box type. Each includes two ovens, two patterns, and a central investment station. The left pattern moves from its oven to the dump box, where it is invested in about 25 seconds. After investment, the pattern moves to its oven for curing, which requires approximately 50 seconds. During this time, the righthand pattern moves from its oven to the stripping station. The shell is stripped, and the pattern moves to investment. After investment, this pattern moves to its own oven. The left pattern comes out of its oven, and the cycle is repeated. Operation is automatic. Each machine goes through 60 cycles an hour.

Pattern plates on these units are 20 x 30 in., and molds are produced into two sizes—20 x 30 and 15 x 20 in. With the former, copes and drags are made on separate machines. For the latter, cope and drag are made on one pattern, and the operator breaks the molds in half.

The machine operator sets cores, if any, and closes the shells on bonding machines. Shells are bonded with liquid resin squirted around the outer edges from a plastic container. Residual heat cures the resin.

Molds Poured on Conveyors—Completed shells are placed on trays suspended on an overhead conveyor system which skirts the shell department. Each tray contains a bed of sand from the green sand shakeout. This bed prevents damage to trays in the event of a runout during pouring and also provides some chilling action. Pouring is horizontal.

Metal is poured from a 500-lb teapot ladle by one man. It is brought to the pouring line in a 3000-lb delivery ladle which also takes metal to the green sand pouring lines. The foundry uses duplex melting, and the same base metal is poured in all molds, shell or green sand, for both standard and pearlitic malleable castings. Heat treatment is varied to produce standard or pearlitic malleable as required.

After the shells have been poured, the tops are sprayed with water to increase chilling action, and the tray conveyor moves on for about a 15-minute cooling period before shakeout.

After initial cooling, trays are tipped automatically to a shakeout which separates sand from the castings. Sand falls through, and the castings are transported to a cooling conveyor. This conveyor elevates the castings and moves them overhead for about 20 minutes, after which they are dumped

To increase chilling action, the man at right sprays water on molds immediately after pouring

Molds enter pouring area on tray conveyor. They are poured from a 500-lb teapot ladle

onto the sprue belt. Feeders, runners, and sprues are knocked off with hammers. Castings are separated into containers by jobs and are given appropriate heat treatments.

Shells Poured Hot—At Albion, the original problems with shell molding were "resin holes" (holes caused by bonding resin) and separation of molds. Both were overcome by the use of liquid bonding resin. Currently, mold cracking is the biggest problem. This cracking occurs during pouring or a few seconds later and is particularly prevalent in molds which are difficult to form with uniform wall sections. The foundry attempts to get around it by pouring while the mold is still at 200 to 300° F, thus avoiding thermal shock. Largely because of this problem, the scrap rate in shell molded castings is somewhat higher than in green sand practice.

Shell molded castings at Albion run from 0.45 lb (twenty to a 15 x 20-in. mold) to 9.5 lb (six to a 20 x 30-in. mold). Yield in shell is slightly better than in green sand. Molding and coring problems are simplified for those castings which lend themselves to shell molding, and tolerances are obtained more easily.

Manpower in the shell molding department includes four machine operators, a utility man to place sand on trays, one iron pourer, one man to spray molds, and a muller man.

Management at Albion sees a rising demand for shell castings, particularly in its markets, which are automotive. Consequently, the company expects shell molded castings to become an increasing percentage of its production in the next few years.

Joined molds are placed on tray conveyor, on a bed of sand from green sand shakeout

SHELL MOLDING

Bendix Aviation Corp.

• • • finds that the cost of finished parts is less than it was when machined green sand castings were used. Labor cost is less, and scrap has been cut from 19 to 3.5 per cent

PRODUCTION of shell molded castings at Lake Shore Division of Bendix Aviation Corp., St. Joseph, Mich., is a money-saving proposition. Their use results in a finished part that costs less than the same part made with a green sand casting.

The Lake Shore Division shell molding operation is the production of gray iron housings for hydraulic control valves and castings for wheel cylinders used in hydraulic brakes. The production rate during a 16-hr day is about 10,500 wheel cylinder castings for three makes of cars and 8000 valve housings.

The wheel cylinder castings weigh about 1.3 lb. One of the valve housings weighs 2.5 lb and the other 3.5 lb. Largest dimension on any of these parts is about 5 in. Tolerance held is ±0.005 in. or less on the full length of any critical dimension up to 2 in. Often the tolerance on any one batch of castings will run between ±0.003 and 0.004 in.

Pattern Temperature Varies—The electrically-heated gray iron pattern plates for these parts measure 20 x 30 in. and produce a one-piece cope and drag which is broken in half to make a 15 x 20-in. mold. Each mold for wheel cylinders has 12 cavities. Those for valve housings have either eight or ten cavities. According to E. C. Zuppann, foundry manager, the castings made in several identical cavities in the same mold will vary in size because of temperature differences in sections of the pattern plate. Proper shell mold curing is a time-temperature function. Time is constant in the curing of one shell, but temperature varies in the pattern, with the result that the degree of curing varies in different sections of the pattern.

To overcome the difficulty created by this situation, the characters on patterns used at Bendix are slightly different in size to compensate for the variation in degrees of curing. Also, patterns are built to produce castings to the high side of the tolerance range when new. As the patterns wear, they will continue to produce castings within the range.

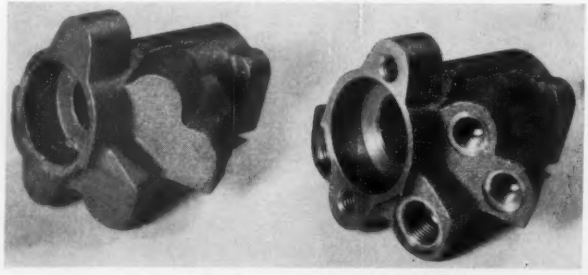
Castings are checked closely with a micrometer on a statistical quality control basis. Charts are kept of each critical dimension for each character on the pattern. On an over-all basis, this practice gives information on changes in procedures or materials. Individual charts show pattern wear and warn when to expect pattern repair or replacement.

Blown resin-sand cores are used for all castings. The resin-sand cores and molds produce castings with a 200 to 250 rms finish.

Scrap Rate Reduced—Since July the shell mold foundry has been operating with an average scrap rate of 3.5 per cent. From July, 1956, to June, 1957, the average scrap rate was 15 per cent. In January, 1957, a technician was put in charge of control over the cold coating sand operation. At that time the scrap rate was 19 per cent. Under the control program it has dropped consistently to its present rate.

Improved casting quality has resulted in elimination of gaging and 100 per cent visual inspection on the wheel cylinder castings. Inspection now consists of moving the castings on a belt conveyor past inspectors who pick out castings that have obvious defects. Although gaging has been eliminated on valve castings, they still receive an individual visual check. Foundry scrap which shows up in the strict, 100-per-cent inspection after machining amounts to 0.6 per cent.

Housing for hydraulic control valve is cast and machined. Relationship of core to external surface and dimensional accuracy are critical



Shell molds are made from an AFS 90-100 Juniata bank sand containing ½ to 1 per cent clay. The sand is cold-coated in an automatically-cycled muller. Ingredients are weighed or measured and consist of 700 lb of sand, 28 lb of dry resin to make a 4 per cent mix, and sufficient alcohol to react with the resin.

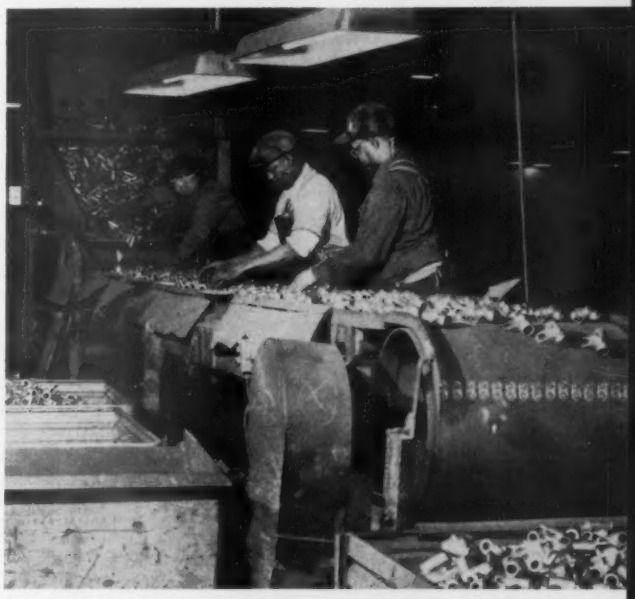
Sand enters the operating muller in 6 seconds, followed by the resin in the next 6 seconds. The two are mixed dry for 18 seconds. Then the alcohol is injected over a period of 50 seconds and the mixture mulled for 105 seconds. During the next 200 seconds air is blown through the muller to evaporate the alcohol and dry the coated sand. The final 60 seconds of mulling breaks up any lumps that have formed. Then the sand is discharged in 12 seconds to a vibrating screen and drawn by a fan from the collector under the screen up a 12-in.-diam pipe to a cyclone collector, from which it falls to a hopper over the four-station dump box shellmaking machine.

Molds Poured Horizontally—Average production is 110 molds per hour. Cores are set and shells glued on a four-station clamping machine. Molds are poured horizontally on a bed of sand on tilting table carriers suspended from an overhead monorail loop conveyor. Poured molds are tipped off to a perforated pan vibrating conveyor and sorted to tote boxes for movement to tumble blast machines. Wheel cylinder castings are blasted with grit; shot is used on the valve castings. Gate stubs are ground off, but no other grinding is done.

Castings that are machined in the company's machine shop have parting lines and any flash is removed by a broaching operation which must be performed in any event. Subsequent machining operations prepare the parts for final assembly. Several machining operations have been eliminated, however, by the use of shell-molded castings. The final cost of the assembled part is less than it had been when machined, green sand castings were used. However, the cost of shell molded castings is higher as they leave the foundry than it had been for their green sand counterparts.

The experience in this shell mold foundry is that labor cost is lower than that for producing the same part in green sand. Resin is the highest cost element in making the shell molded castings.

Operator removes mold from four-station machine. One of four turntable bonding stations is shown at left. Pouring conveyor is in foreground



Inspection of castings on a continuously moving conveyor belt is possible when casting quality is high and inspection after machining is rigid

Wheel cylinders for automotive hydraulic brakes. Dimensions of D-shaped locator and flatness of surrounding area must be maintained closely

SHELL MOLDING

Engineering Castings Inc.

• • • is producing thousands of small castings daily in stacked shell molds. As a result of its experience, the management plans to increase production of shell molded castings

STACK molding is a tradition at Engineering Castings Inc., Marshall, Mich. Since the company began operations, most of its production has run to small, close-tolerance automotive castings which lend themselves to the stacking technique. As a result, when the company went into shell molding, it adapted its green sand experience to fit the new molding process. Today, the firm daily produces small castings by the thousands in stacked shell molds.

Sand for the shell molding operation is brought in by truck. A fork lift truck transports it from the storage bin to the shell molding department in dump boxes, and cold-coated mixes are formulated in 150-lb batches in a portable muller. The mix contains 150 lb Vassar No. 1 sand of 120 AFS fineness, 5.8 lb of powdered resin, 1½ lb of alcohol, and 4½ oz of calcium stearate to aid release.

Sand and resin are folded together, then mulled for 30 seconds. Alcohol is added, and the mixture is mulled for 1½ minutes. The calcium stearate addition follows, and the mixture is mulled 30 seconds longer. Then the blower is started, and a 9-minute cycle run out. Total cycle time thus is 11½ minutes.

Molds Are Blown—The company operates two shell molding machines of different types. Mulled sand is screened into an elevator on one unit, which blows sand down, and into a hopper on the other, which blows sand up. The latter machine blows up into a pattern-die which resembles a corebox more than anything else.

It produces two types of molds. One is a complete mold with gates on one side and mold cavity on the other. The second type is made with mold cavities on both sides. For this type, the gating is made on a flat plate on the down-blow machine.

On the up-blow unit, die and heater are tilted 90 degrees backward to the blow magazine, which blows two molds 11 x 13 in. or one mold 22 x 26 in. After the molds have been blown, they are cured by gas heat. They then are vibrated to drop excess sand back into the charging box. Molds are hollow, much like a shell core. Since the mold is a one-piece affair, there are no halves to join. Each mold is weighed since too light a mold might permit a runout and too heavy a one wastes sand mix. Curing time is adjusted as required.

Stacked Molds Pasted—Pasting is required only for stacking. When gating is on the flat plates made on the down-blow unit, those plates are interleaved between molds. In both instances, resin paste is squirted around the edges and cured by residual heat as the molds or the molds and flat plates are stacked. Stacks are formed on pallets which are moved to the pouring area by fork lift truck.

Stacks are placed on sand-covered plywood bottom boards, two to a board, on a transverse section of roller conveyor. They are fed onto another roller conveyor on which they are poured. Stacks are weighted, and metal is poured into carbon-dioxide-

Unit at left makes flat plates with gating for stacks. Molds are blown on machine at right

hardened pouring basins, down a common sprue.

The metal is brought from electric furnaces, in which the company does all its melting, in overhead ladles which are manually pushed and poured. These ladles are moved down the pouring line by means of the overhead tramrail.

After first cooling, stacks are pushed off the conveyor onto the floor. Sand peels from the castings so neatly that gates are not cleaned before they are remelted, although green sand remelt must be cleaned. Shakeout sand is shoveled into dump boxes which are carried to haul-away trucks by fork lift. Sand is not yet reclaimed.

Stacks of castings are palletized by ladles—or by heats if only one ladle is poured from a heat. They are moved to a cooling area where they are broken off individually with a hammer or by shocking the sprue. Heaviness of castings and sprue determines the method. Segregated pallets are necessary because castings from each heat or ladle are inspected separately and are held for release by quality control personnel.

Check for Quality—The quality control department, under the authority of the plant metallurgist, runs necessary check procedures, in accordance with standards set up for the alloy and the part in question, before the castings are released for finishing—that is, for cleaning, snagging, inspection, final test, and shipping.

Hardness tests and carbon analyses are run on samples from every heat. Every fourth heat, an analysis is run by an outside laboratory. Upper and lower limits and a mean figure are set for every element in the analysis. Statistical quality control spots trends and permits adjustments to charges as required.

Engineering Castings went into shell molding largely because it wanted to see what could be done with the process. Today, the management feels that one of its prime benefits has been in what shell molding has taught it about green sand practice, resulting in substantial improvements in the latter. Specifically, the company discovered that dimensions of shell molded castings were closer than they were for the same castings in green sand molds, indicating swelling in the latter. Now, closer control of green sand mold hardness is maintained.

Management feels that when castings must be finished to get smooth surfaces, green sand is as good as shell. On as-cast surfaces, however, shell molding does a superior job. Both types of molding yield the high tolerances required by the types of castings the organization produces.

Must Learn To Use It—Representatives of the company stress that foundries must learn how to use shell molding to best advantage—that it won't solve all problems. They feel that the future of the process is expanding, that it can do better than green sand for certain types of castings, particularly tall ones which present draft problems in green sand, and that those types are becoming more common.

Procedures and equipment discussed in this article might be considered the result of a 5-year development program during which the manufacture of certain specific shell molded castings has been brought to production status. Improvements have been made and problems solved so that production manufacture of these castings may be regarded as proved and practical.

For pouring, CO_2-hardened pouring basins are used. Weights also are placed on stacked molds

Now, however, under the stress of heavier production demands and the need to obtain lower unit costs with dependability of uniform results, certain changes in process are contemplated and have been started. Equipment has been contracted for to provide automatic mixing and coating of preheated sand by the hot sand, liquid coating method. This system will provide greater productive capacity and better economy and quality.

Additional molding machines of both dump and blow types also are contemplated. Finally, a system of sand reclamation is regarded as a must, and this matter is being worked on in the hope that it can be provided at an early date.

Metal Shrinkage a Problem—For themselves, the management of Engineering Castings feel that shell molded castings will become an increasingly larger percentage of their production—perhaps even 100 per cent some day, but only after they have learned a lot more about it. They emphasize particularly that foundries need a better understanding than ever of metal shrinkage to take full advantage of the process. This problem is particularly important at Engineering Castings because the foundry usually is running 15 to 20 alloys. These alloys include high carbon steels, high chrome steels, hardenable irons, Ni-Hard, Ni-Resist, ductile iron, ductile Ni-Resist, alloyed hard white irons, and high nickel.

SHELL MOLDING

M. A. Harrison Mfg. Co.

• • • believes that customers must be educated to the possibilities of shell molding as a cost saver for certain types of castings. It finds that shell mold pattern costs are high

THE MANAGEMENT team of M. A. Harrison Mfg. Co., Birmingham, Ohio, a producer of brass and bronze hydraulic pump parts almost exclusively, foresees the future of shell molded castings confined to 1) intricate parts not easily made in green sand molds and 2) parts on which difficult machining operations can be reduced or eliminated.

In addition, it is felt that the production run for such parts should be in excess of 5000 castings. The foundry has had trouble selling parts not in that category.

Buyers' resistance can be illustrated best by citing a recent experience of the foundry with a customer who buys brass water pump impeller castings produced in green sand at the Harrison foundry. This impeller is a multiple-vaned job well adapted to the shell molding process. The foundry sales engineer pointed out that the smoother finish and better casting properties attainable through shell molding would increase the efficiency and quality of the impellers and of the pumps in which they are installed. This was of considerable interest to the customer, who has a long-time reputation for mak-

Workers pour molds laid horizontally on a sand bed on portable, waist-high metal tables

Operator removes mold from one of the patterns on the two-station, automatic machine

ing high-quality pumps. Higher cost of pattern equipment, the slight increase in the casting's cost, and the lack of experience with shell molded castings, however, stood in the way of making the switch to the newer molding method.

Designers Not Sold — This last point, in the opinion of Harrison's management, is an important obstacle to development of a broader market for shell molded castings. Many designers and engineers of equipment have not yet been convinced of the advantages of using shell molded castings for certain components of finished equipment. As experience with such castings accumulates, it is believed that engineers can take advantage of their smoother as-cast surfaces and closer tolerances when designing parts for new equipment. Then, too, cost will become less a factor when production runs are sufficiently long.

Although Harrison furnishes machined parts to about 80 per cent of its customers, it has had only limited success in using the shell molding process to reduce machining costs. One of the reasons is that production runs have been too short to permit the reduction in machining requirements to offset the relatively high pattern cost. Also, customers designed most of the parts originally as green sand castings with the expectation that considerable machining would be done. Customers still specify extensive machining on a shell-cast part.

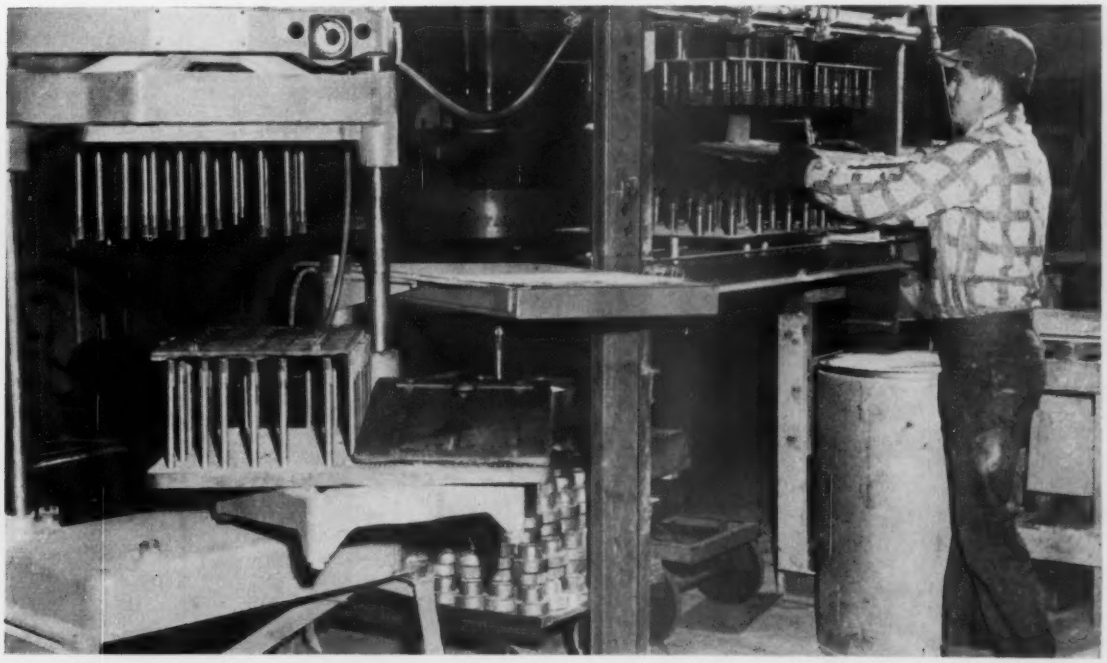
Tolerance Closer than Requested—The Harrison foundry holds a tolerance of ± 0.0035 in. per in. on most of its shell castings. On pilot runs the variance has been held to ± 0.001 in. per in. Neither of these tolerances, however, is held across the parting line. Also, none of the foundry's customers has specified the closer tolerance. This, again, is an indication to the foundry that customers do not understand the full potential or have sufficient experience with the process to take full advantage of it. Nor have customers asked for a finish finer than that produced with an AFS 90, four-screen sand. Consequently, the foundry uses the same subangular, washed and dried silica sand for both shell and green sand molds.

Shell molded castings comprise about 8 per cent of the foundry's 60-tons-a-month production. Most of the castings are poured in high-lead alloys, and weights run from a few ounces to 3 lb, although one of the largest castings weighs 24 lb. Dimensions range from 1 to 8 in., the average being 4 in.

Molds are produced at the rate of two, 20 x 30-in. combination cope and drag shells every 3 minutes on an automatically-cycled, two station, dump-box machine. Shells are broken in half to form 15 x 20-in. molds. Conventional oil sand cores are used where coring is required. Shell halves are held together by powdered thermosetting resin which cures while the mold is held in a spring-loaded clamping fixture. Finished molds are rolled on wheeled racks to the pouring area in the green sand foundry and laid on a sand bed on waist-high tables for pouring.

The sand-resin mixture is considered critical. All ingredients are weighed carefully. Additions to the sand consist of 5 per cent powdered resin and ½ per cent western bentonite, which is employed to prevent the shells from cracking. Mixing time is 12 minutes. That is considered a minimum time for thorough blending. An extra minute or two does no harm.

Shell mold valves are bonded by powdered thermosetting resin which cures while the mold is held in a spring-loaded clamping fixture



SHELL MOLDING

Midwest Foundry Co.

• • • has to charge more for shell molded castings, but customers get finished castings at less cost. Demand for castings produced by shell molding is on the upswing

MIDWEST Foundry Co., Coldwater, Mich., is something of a pioneer in shell molding in this country. Its experience with the process began in 1952. This comparatively early entry into the field was made because management felt that shell molding was a new tool that would permit certain types of jobs to be done better and easier.

Final Cost Is Less—Today, after its relatively long experience with the process, the firm finds that it has to charge more for shell molded castings, than for sand castings, but the customer gets a finished casting at lower cost because of reduced machining expense. Midwest doesn't guarantee specific tolerances, but those it gets are better than what it can achieve in green sand. Virtually all shell molded castings made in the shop are sold on that basis.

An interesting angle on this pioneer shell operation is that, originally, customers had to be educated to shell molded castings. Today, the converse is true. Customers often demand the process. Midwest feels, however, that each casting should be considered individually for shell molding. In addition, it is important for the foundry to know its costs so that it can price castings properly, whether they are in shell or green sand molding.

Simple Sand Mix—Sand is trucked in and unloaded automatically by a screw conveyor. The sand conveyor dumps it onto a belt conveyor which carries it to storage in a 150-ton silo in the shell department. From the silo, sand flows by gravity to a bucket hoist which elevates it to a platform over the molding area. There it is charged into a twin-cone blender with 900-lb capacity. The mix is simple—800 lb of Vassar bank sand of 100 AFS fineness (less than ½ per cent clay) and 40 lb of dry resin. Including charging, the mulling cycle requires 12 minutes, about 10 minutes of which is for blending. One man handles the sand mixing job.

Sand mix is discharged from the blender into a bucket on a monorail and is distributed to hoppers over the three shell machines. These are two-pattern, two-oven units with central dump-box investment. Automatic in operation, they alternate patterns at the dump box. Patterns are 20 x 30 in.

All jobs at Midwest are made with cope and drag on the same pattern. The machine operator breaks the shell in two to form a 15 x 20-in. full mold. Each machine is operated by one man. He sets cores, if any, joins mold halves, and sprays the pattern with release agent every 8 to 10 cycles.

Foundry Engineers Patterns—Midwest engineers all its own patterns and makes some of them in its own pattern shop. When patterns are made outside, the job is given to a tool and die shop without pattern experience. These shops, the company says, will do a good job by following design closely, without deviation or preconception based on green sand pattern experience. The foundry does all its own maintenance and repair.

Cleanliness of patterns is of great concern at this foundry. Every 24 hours of use, patterns are blasted with walnut hulls as the abrasive. Most patterns are constructed of gray iron.

Uses Bonding Fixture—Shells are joined in what apparently is a unique method. For each job, the foundry constructs a fixture from strips of metal welded together in such a fashion that the fixture places a line of water-resin slurry around the periphery of the shells. The operator takes the fixture from a panful of slurry, shakes off the excess mixture, and places it carefully on the drag shell. Shells are closed on a bonding machine, and residual heat cures the resin mixture.

Closed molds are placed in racks on pallets at each station. As the pallets are filled, fork trucks move them to the pouring area, where they are placed on the floor and poured from hand ladles.

Express Line Supplies Metal—The same cupola provides metal for both shell and green sand molded castings. Metal is brought from the cupola on an express monorail line in 500-lb ladles and transferred to 50-lb ladles used by the iron pourers.

Metal for steel castings is melted in four electric

Welded fixtures are used to join shells. Here, operator dips fixture in a panful of water-resin slurry. Excess mixture then is shaken off

Operator places fixture on drag shell, leaving a line of water-resin slurry around periphery. Care is required

furnaces in another section of the foundry. For these jobs, shell molds are transported to the furnace area, where they are poured. Castings are automotive-grade gray iron and high-alloy steel for automotive and refrigeration applications. All are poured horizontally, most of them with no backing. If the casting is heavier than usual, it is poured on a sand bed. Weight of castings ranges from ½ to 40 lb and averages 1 lb.

Cooling varies with type of casting. After cooling, molds are scooped up into piles by a front-end loader. These piles eventually are carried by front-end loader either to a manual shakeout, on a table with a screened top, or to an oscillating shakeout. Gates are so thin that the castings usually separate by themselves. If they do not, they are easily knocked off.

Sorted castings are fork trucked to the grinding department—a separate building—in gondolas. They are snagged, cleaned, 100 per cent visually inspected, and packed. Some also are gaged 100 per cent.

Molds are placed on floor and poured from 50-lb hand ladles. Metal comes from cupola via an express monorail

View of pouring floor. Molding department is at right, includes three two-station machines. Front-end loaders scoop up poured molds

Shell Pattern Equipment

Must Meet High Standards

Shell molding patterns are mean to design, tougher to make, and expensive to buy. This article describes some of the problems and suggests how foundrymen can help patternmakers

By RAY OLSON
Vice President
Southern Precision Pattern Works Inc.
Birmingham

SHELL molding patterns are stinkers. They are mean to design, tougher to make, and expensive to buy. Although many of us are still trying to find a cheap, simple way to make good-quality shell pattern equipment, the basic job requirements prevent many would-be short cuts.

We must remember that we are working with a process which requires the surface of the pattern to be between 400 and 600° F. Remember also the mold itself is as tight as mustard plaster and as hard as sandpaper against the surface of the pattern. And bear in mind that frequently we are looking for castings so smooth and accurate that they can slide down the automated line, drop into the chuck and be located properly, untouched by human hands. Each of these requirements adds something to the complexity of the job.

Pattern Materials—Much has been said during the years we have been shell molding about pattern materials. Most applications have been filled by gray iron or, better yet, alloyed iron. Iron can be cast, machined, and polished to a surface fin-

Fig. 1—Intricate design requirements necessitate that some shell patterns be made of an assembly

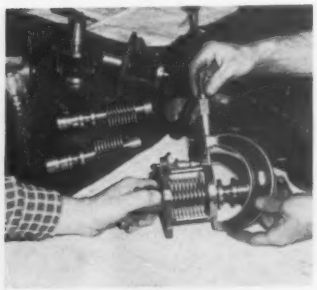
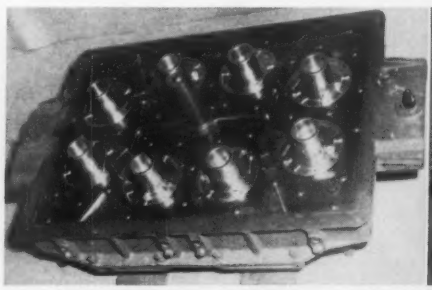


Fig. 2—Both halves of a 20 x 30-in. shell pattern, assembled in pattern carriages which are part of a two-station shell molding machine. An automotive jobbing foundry employs this arrangement



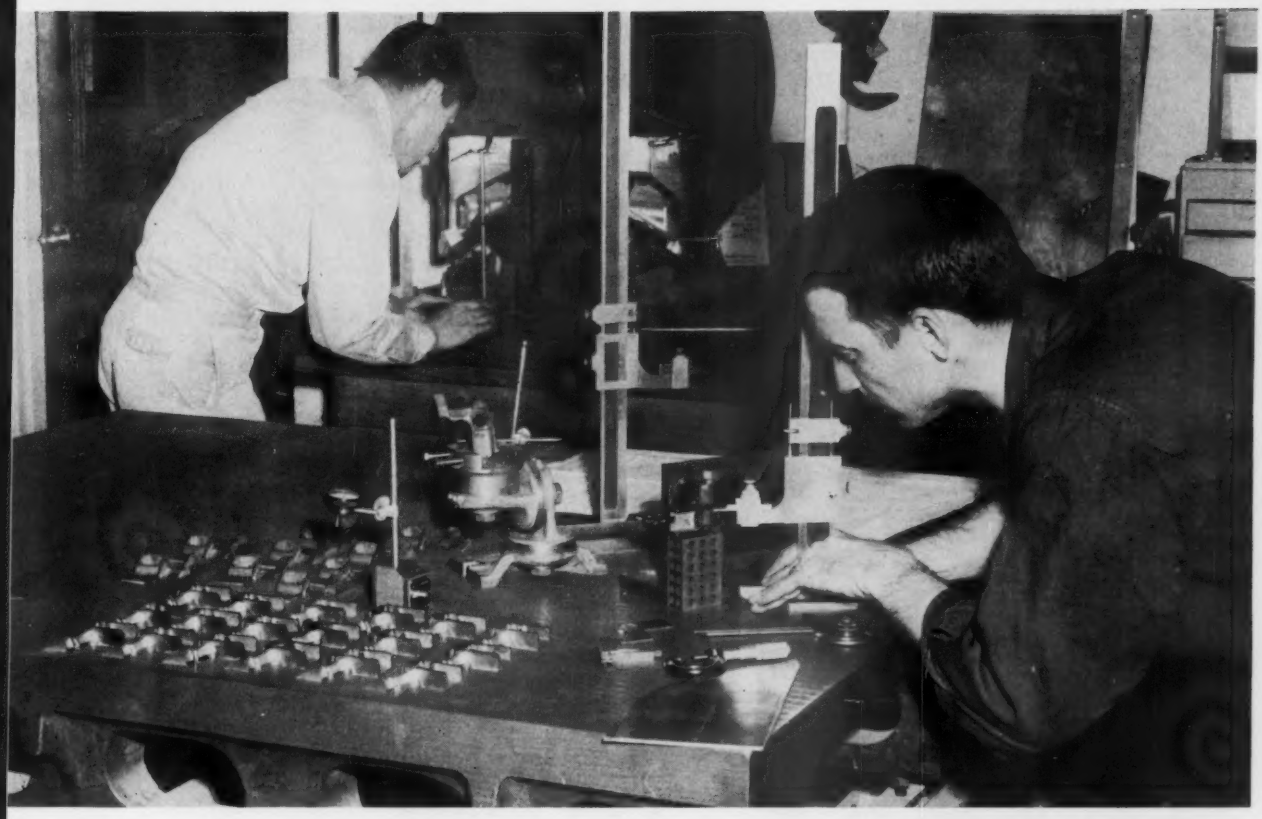


Fig. 3—Twenty special machine setups involving simple fixtures or compound vises were required to insure the repetitive accuracy of this pattern for shell molding

ish which releases readily from a cured shell mold. Iron has fair heat transfer properties which permit shell buildup, cure, and replacement of pattern heat loss in a reasonable cycle time.

In some cases cast steel or steel bar stock makes the best shell pattern material where the pattern is either exceptionally fragile or subject to unusual wear. Some copper-base alloys work well in many applications. Shell patterns made of this material are somewhat more subject to wear and scuffing than iron patterns, but generally they have better heat conduction and machine more readily.

We might emphasize here that extreme care must be taken when using dissimilar materials in pattern construction—for example, brass or aluminum patterns mounted on cast iron plates. Strange things can happen when unequal expansion takes place at perhaps 500° F pattern temperature. In one case, for instance, some shell molded castings showed a decided mismatch, but the patterns checked out exactly in line on several careful examinations. In each case, however, the pattern equipment was checked at room temperature. What happened was that in service the brass pattern was expanding more than the cast iron plate on which it was mounted.

Aluminum has been used with varying success in shell pattern applications. Most shell foundries do not care to use it because of wear and damage. Any surface defect on a shell pattern that will cause a grain of sand to lodge will start a wear area. Aluminum, being much softer and more subject to pin holes, greatly aggravates this condition. Aluminum is an excellent conductor of heat, however, and can be processed or finished at fairly low cost. We believe aluminum can be used on experimental or low-production applications with moderate success. Always keep in mind that the pattern materials and method of assembly must work efficiently at elevated temperatures.

Plan for Ejector Pins—The problem of removing a rigid thin mold or shell from the surface of a hot pattern makes necessary additional requirements. Ejector or stripping pins are required to lift the mold from the pattern. The design and placement of these pins is affected not only by the pattern contour but also by the type of machine used to produce the molds. Type and source of heat used to maintain pattern temperature also must be considered in ejection pin location.

Hand in hand with this requirement goes the design of the shell pattern plates. Manufacturers of shell pattern equipment either must be thoroughly familiar with shell molding machine operation, or detailed information should be supplied them by foundry engineers relative to ejector pin and pattern plate design.

Draft Allowances—We mentioned briefly the

necessity for having a smooth, polished surface on shell molding patterns. It is a most important requirement. Of even more importance is the need for flat, accurate draft allowances. While it is true that in some cases shell molds are made from patterns which have square, perpendicular surfaces with no draft allowance, this design is not typical or recommended. As is the case in other foundry techniques, the less draft that is provided, the more pattern wear occurs and the more critical the molding operation becomes. Careful polishing or hand finishing is desirable on vertical surfaces to eliminate the fine machining lines which can cause shell sticking.

Parting Surface—The rigid shell mold magnifies other pattern details besides the draft allowance. The parting surface between the two mold halves must be parallel and true. Any variations can cause shell distortion or breakage. Perhaps finning will occur in some areas of the mold because of lack of a flat pattern plate. Loss of tolerance across the parting line is one of the major problems in shell molding. Every effort must be made to make all portions of the mold which contact each other be exact in the pattern equipment.

Shell castings are specified in many applications where size and shape control is the major factor. This situation is a natural result of the more accurate machining of castings in newer tools and fixtures. In the case of smaller shell castings especially, relatively more tooling in the pattern shop is required. We find it necessary to make jigs and fixtures to hold our shell patterns for each machining operation. It is the only way we have found to duplicate a number of patterns to very close tolerances. In fact, the latest toolmaking and diesinking equipment is almost mandatory in the production of shell pattern equipment.

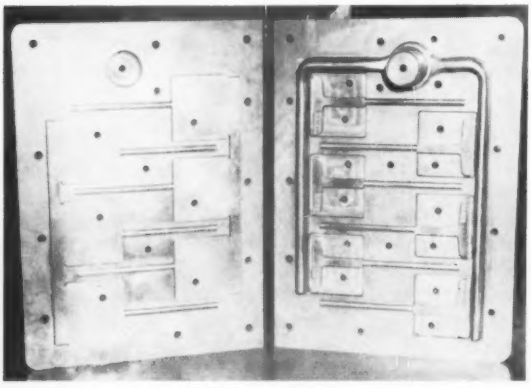


Fig. 4—Shell mold pattern for textile machine casting. It gave closer tolerances than green sand casting and eliminated costly hand fitting

Fig. 5—Certain types of shell molding machines require heavy, solid pattern plates of this sort

Why They Feel That Way—At the outset we said shell patterns are stinkers. Many patternmakers feel that way—and justifiably so. They may have been asked to produce a shell pattern to .000 tolerance. They may have received little or no information regarding the casting as to end use, machining operations, locating points, and the like. They may have had to guess on proper shrinkage allowance, plate layout, gating, etc. And they may have been criticized about the price it was necessary to charge for the equipment.

As production increases and more foundries become familiar with shell requirements, much of the "odor" can be sweetened. If the foundryman wants to get the best results with shell patterns at the lowest possible cost the following checklist may be helpful:

1. Provide your patternmaker with all the information you can get about the casting you are going to make. He will be interested in all the details. He must, of course, know the amount of stock which will be left for machining. He should know about all the chucking or locating points to be used. How the finished casting is used or assembled may affect draft allowances, etc.

2. It is also necessary to lay out the arrangement of the patterns in the mold. Make sure that there is ample room for gating, ejector pin location, and, last but not least, mold contact area for bonding or cementing the two halves of the mold together.

3. Indicate to your patternmaker the areas of the casting which are most critical and those where a little more tolerance can be allowed. This information is most important in helping to reduce the cost of the finished pattern.

4. Give your patternmaker a reasonable amount of time to do his job. In too many cases shell castings are sold on a deliver-tomorrow basis. It takes time to do a precision job, and rushing too often leads to unhappiness on all sides. Most shell patterns require from 4 to 8 weeks to make, starting from the blueprint.

5. Either equip your own pattern shop with skilled men and good machine tools or check the jobbing shops carefully. Make sure that you are buying skills, equipment, and dependability when looking for shell equipment.

If you are not in a position to supply most of the information in this checklist, it is almost imperative that you use a vender who can not only build but also engineer the pattern equipment you are purchasing.

In shell molding we have a practical, high-production, foundry process. It can reach the peak of its effectiveness in our industry only if we use the best possible tools.

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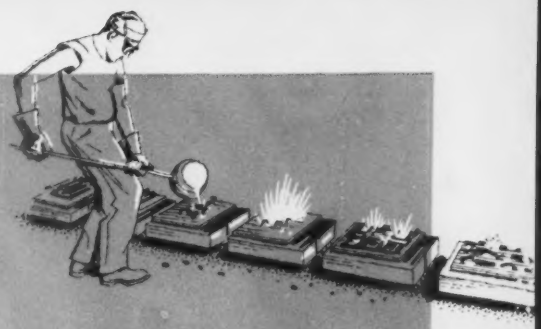


Controlling Variables in

Processing Shell Molding Sands

This article briefly summarizes the results of tests at the Foundry Resin Laboratory, General Electric Co., concerning effects of certain variables on properties of resin-coated sand for shell molding

RELATIVE simplicity of the shell molding process can be deceiving. This simplicity is attained only after well planned introductory efforts determine the best set of conditions for a particular shop. Actually, foundries are faced with numerous variables when starting shell molding operations. Once optimum conditions have been determined, rigid control of the several variables is necessary to obtain high-quality castings.

The trend in shell molding greatly favors resin coated sand over the dry sand-resin mix. Introduction of coating techniques to foundries offered its initial problems, but currently a growing number of foundries of all sizes are successfully coating sands for shell molding use.

Much has been learned about the influence of various factors during the short time that sand and phenolic resins have been used as a molding medium. Not only foundries, but also suppliers of materials and manufacturers of equipment, have conducted extensive studies in an attempt to improve the efficiency and economy of the process. Considerably more work of this sort remains to be done.

An example of one phase of shell mold investigational work is a series of studies on the resin coating of foundry sands conducted at the Foundry Resin Laboratory of General Electric Co., Pittsfield, Mass. These tests have provided some of the answers to the question of what effect certain variables have on the tensile strength and other properties of resin-coated sands for shell molding use.

The following are brief summaries of some of these findings:

How Thick Is the Resin Coating? Using recently published information (*) on surface area of sand and known density values for phenolic resin, the film thickness of a resin coating may be calculated. Assuming uniform resin distribution, 3.5 parts resin on a round grain sand of AFS 110 fineness, the resin coating is 0.00004 in. thick. Further calculations reveal this thickness to be in the order of 500-1000 resin molecules.

(*)"Sieve Analysis Determines Surface Area of Sand" by Robt. E. Morey, FOUNDRY, August, 1957, Page 100.

SOLID RESIN STUDIES

Effect of Resin-Solvent Ratios and Resin Per Cent on Tensile Strength of Resin-Coated Foundry Sand. Sand samples were coated with dry powdered cold coating resin, employing varying resin contents and resin-solvent ratios. Tensile strength values were obtained and plotted for each resin content against time of mix plasticity (see Fig. 1). "Mix plasticity" represents the elapsed time from 30 seconds after the solvent addition to breakdown of plasticity.

Principal conclusion to be drawn from this study, as indicated in the chart, is that unless enough solvent is used to produce mix plasticity of approximately 3 minutes or more (only for open low-speed mullers), maximum tensile strength is not being developed.

A subsequent test of a similar nature used an improved coating resin of the "built-in lubricant" type. This test showed that (1) tensile strength of resin-coated sand increases with resin content, (2) tensile strength at first increases with increasing amounts of solvent up to a maximum, but beyond that range additional solvent (in amounts beyond economic feasibility) results in decreasing tensile strength (see Fig. 2). Optimum resin-solvent ratio varies with the particular resin, resin content, and sand to be coated.

Effect of Various Solvents. Of the various solvent systems investigated, including alcohol-toluene, al-

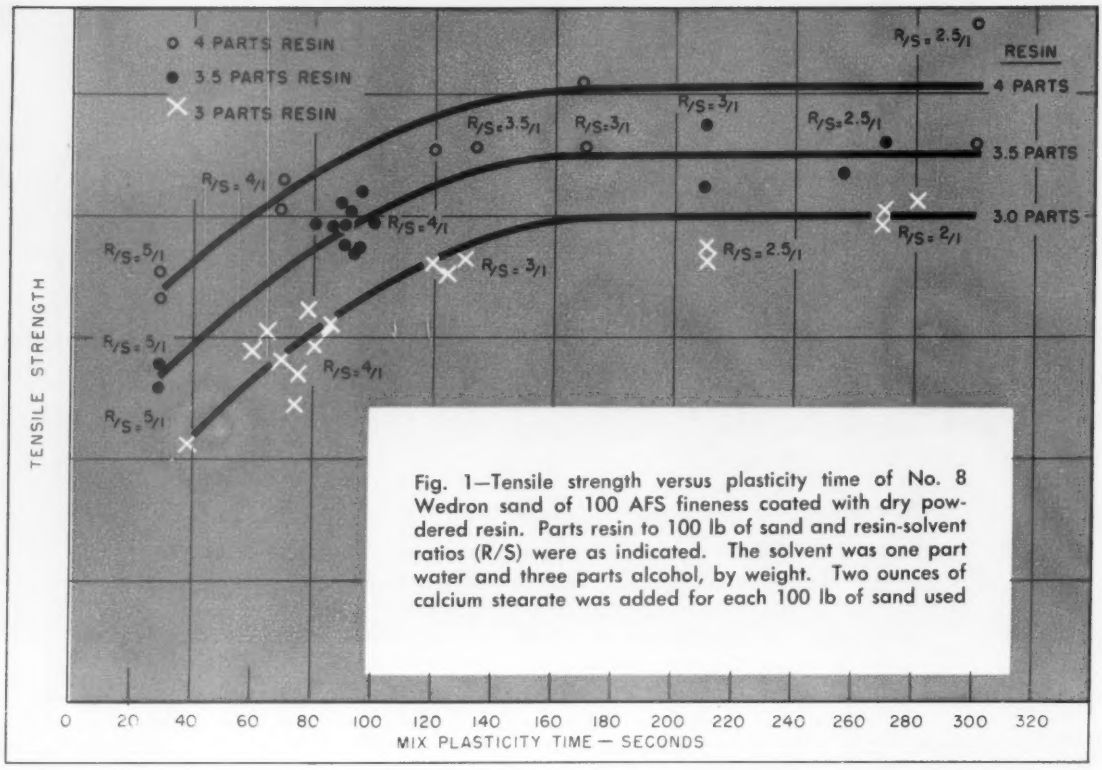

4 PARTS RESIN
3.5 PARTS RESIN
3 PARTS RESIN
RESIN
4 PARTS
3.5 PARTS
3.0 PARTS
TENSILE STRENGTH
MIX PLASTICITY TIME — SECONDS
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320

Fig. 1—Tensile strength versus plasticity time of No. 8 Wedron sand of 100 AFS fineness coated with dry powdered resin. Parts resin to 100 lb of sand and resin-solvent ratios (R/S) were as indicated. The solvent was one part water and three parts alcohol, by weight. Two ounces of calcium stearate was added for each 100 lb of sand used

cohol-xylene, and alcohol alone, alcohol-water (3-1 by weight) system gives highest tensile strength. None was effective in reducing severity of green strength build-up. Early breakdown of green strength is not necessarily indicative of a short total cycle.

Effect of Drying Air. In a study introducing atmospheric drying air, first at the breakdown, secondly at solvent addition, compared to no drying air, the conclusions were: Highest tensile strength was obtained when no air was added, with approximately equal tensiles for the two other conditions. Shortest cycle time was obtained by introducing drying air just after solvent addition.

Effect of Water Content of Sand Prior to Coating with Dry Powdered Phenolic Resin. Test procedure was to add various percentages of water to dry sand and mull for 5 minutes before addition of dry powdered resin and solvent. These conclusions were reached:

1. Sand containing ½ per cent moisture (simulating wet sand in the shop) is unsuitable for cold coating with dry powdered resin. The mix has no visible green strength build-up and breakdown. As the cycle progresses, the resin begins to segregate from the sand and results in an unsatisfactorily weak mix. This condition commonly is referred to as "salt and pepper" and is generally related to excessive moisture in the mix, whether from the sand, the solvent, or from a build-up of water concentration during retarded solvent evaporation.

2. The addition of ¼ per cent moisture (based on sand weight) does not harm the mix or lower the tensile strength compared with dry sand.

3. Moisture increases the mix plasticity time between 0 and 0.25% H_2O.

Another study investigated the effect of subsequent water additions to completed resin-coated sand mixes. Except for wetting the mixes, additional moisture produced no visible change or reaction. It did, however, leave a residual green strength, even though the mixes were remulled for a longer period of time than the original mixes.

LIQUID RESIN STUDIES

Effect of Sand Temperature on Drying Cycle and Tensile Strength of Resin-Coated Sand. Liquid resin was applied to sand having temperatures of 45-58° F and 75-82° F to determine the effect of sand temperatures commonly encountered in winter vs. summer.

Results showed that cold sand increases mix plasticity time. It also gives indication of lower tensile strength, and results in some residual green strength for a mulling cycle equivalent to that for the sand at the higher temperature range.

Investigation of Various Methods of Adding "Hexa" During Cold Coating of Foundry Sands with Liquid Resin. In this test, the hexamethylenetetramine was added in three different ways—dry, in a mixture with resin, and in water slurry. All mixes had approximately the same tensile strength, but the shortest total cycle was obtained when hexa was mixed with the liquid resin.

Effect of Order of Addition of Resin, Hexa, and Lubricant for Cold Coating Foundry Sands with Liquid Resins. Pertinent data regarding cycle times and coated sand properties for the different addition sequences were noted, and analysis of these

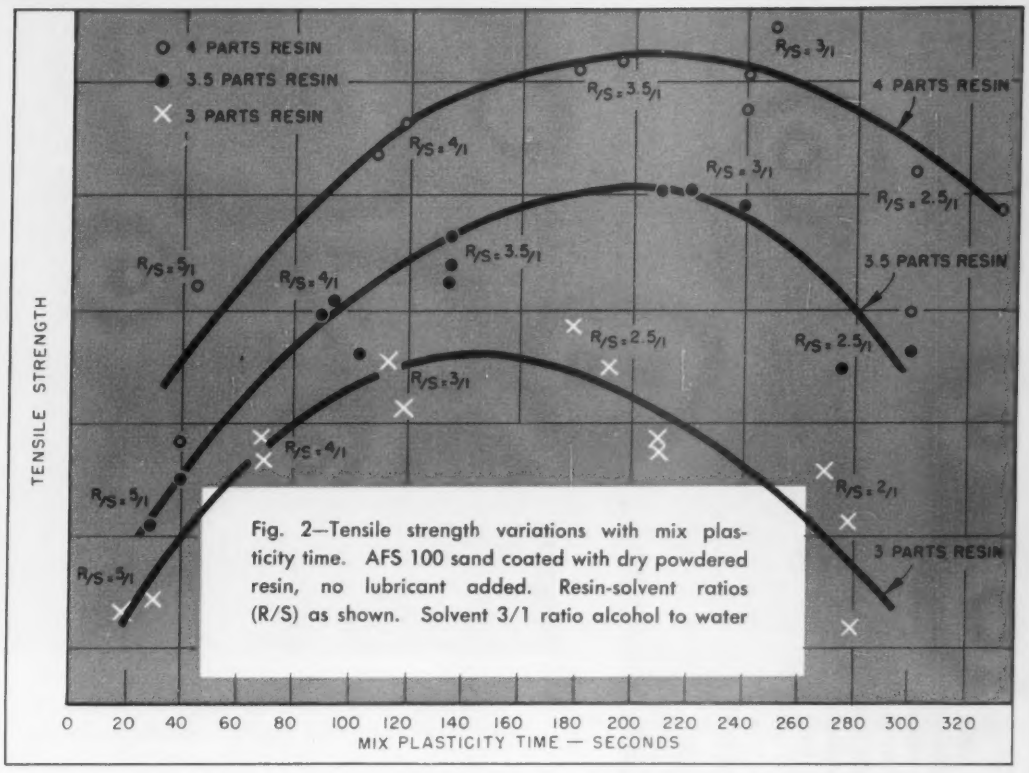


Fig. 2—Tensile strength variations with mix plasticity time. AFS 100 sand coated with dry powdered resin, no lubricant added. Resin-solvent ratios (R/S) as shown. Solvent 3/1 ratio alcohol to water

data resulted in the following conclusions.

1. Best order of addition, from the standpoints of tensile strength and drying cycle, is first to distribute liquid resin over the sand grains, next add hexa, followed at breakdown of plasticity by addition of the lubricant.

2. When a wax lubricant is used (instead of calcium stearate), approximately equal results are obtained whether it is added with the hexa or later as described above.

3. Hexa added to mixes in a 25 per cent and 50 per cent water slurry (based on hexa weight) increases mix plasticity time but does not increase total cycle time significantly. No appreciable effect is noted on tensile strength.

4. Mixes using calcium stearate as a lubricant have lower tensile strength than those with wax lubricant.

Another study concerned with wax additions compared the effect of adding all of it after breakdown with that of making two separate additions. In the latter case one-half of it was added to the dry sand and distributed, the remainder being added after the green strength breakdown. The "divided" wax additions gave indication of increased tensile strength, although no difference was noted in plasticity time, total cycle, or degree of plasticity.

Studies of Liquid Sand-Coating Resin Performance at Variable Solids Contents. This work investigated the effects of variations in weight and percentage of solids in liquid resin. Percentage of solids ranged from 50 to 70 per cent. These results were observed:

1. When the resin solids weight was held constant, a lower percentage of solids resulted in higher tensile strength and longer mix plasticity time. Total cycle time, however, was not appreciably affected by the percentage of solids of the liquid resins in the ranges used.

2. Tensile strength increased with the weight of the resin solids for any given percentage of solids.

3. Total cycle time generally increased with the weight of solids.

4. Mix plasticity time generally decreased with the number of parts of solids (based on sand weight) while the percentage of solids in the liquid resin was held constant.

This condensation of conclusions represents some significant findings over a considerable period of time. It must be kept in mind that these studies were conducted under laboratory conditions on mixes in the order of one-third production volume. Area exposed for solvent evaporation in equipment does not increase proportionately with mix weight, and appropriate adjustments must be made when scaling upward.

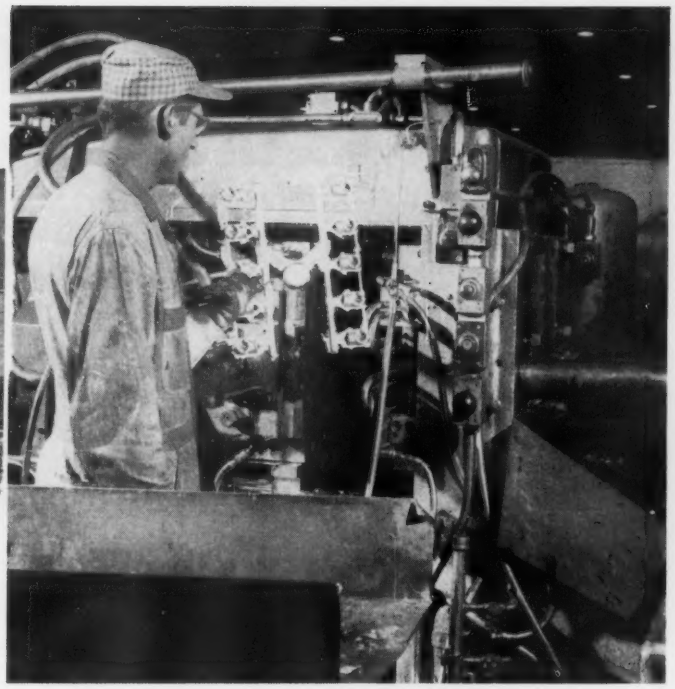
At present numerous techniques for resin coating are employed. Various combinations and modifications, including heated and room temperature sands, dry and liquid resins, with and without heated drying air, are being used. No single technique can be singled out as best under current conditions. If one emerges with unanimous preference, it will be an improvement over these mentioned and must offer to the foundryman more ease in processing, higher quality of product, and greater economy in the process.

DIECASTING FOUNDRY

Makes Automotive Hardware Parts

Modern aluminum and zinc diecasting facilities and automatic equipment for machining, buffing, and plating are included in new plant for producing automotive hardware

By ROBERT H. HERRMANN
Associate Editor



Aluminum rocker arm shaft supports are cast ten to a die in cold chamber machines

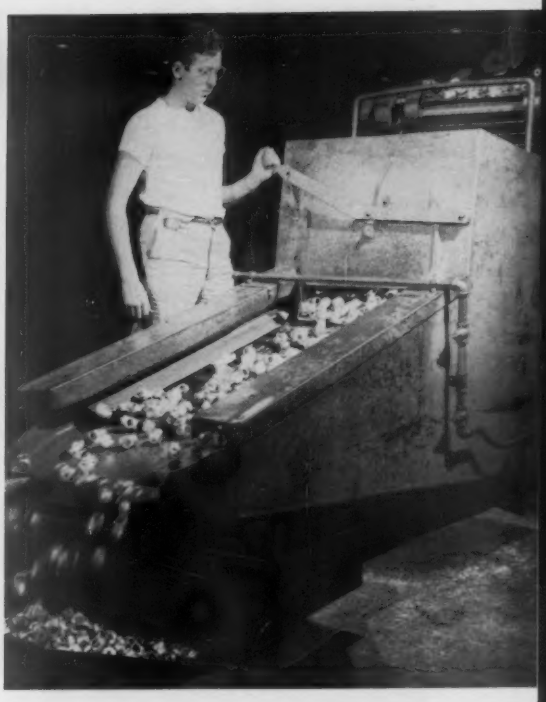
FORD Motor Co.'s Sandusky (Ohio) Hardware Plant produces automotive hardware parts for all lines of its cars and trucks. The plant features modern aluminum and zinc diecasting facilities, automatic equipment for machining the castings, large stamping presses with automatic handling devices, automatic plating and multiple-station automatic buffing machines, and various assembly operations.

Diecast aluminum parts include valve rocker arm supports, oil pump bodies, generator and starter end plates, distributor bases, fuel pump adapters, and transmission parts. Zinc parts include steering column brackets, distributor diaphragm housings, lamp housings, instrument cluster panels, door vent frames, door lock striker plates, headlamp rings, rear-view mirror arms, and radiator grille emblems.

Aluminum Foundry Operations—Daily production of aluminum castings is at the rate of approximately 63,500 lb. SAE alloys 305 and 308 are melted, interchangeably, in two 20,000-lb gas-fired reverberatory furnaces. A third furnace is kept in standby condition. Melting rate is 2000-3000 lb an hour, and charges consist of approximately two parts ingot to one part remelt.

Aluminum ingot and zinc slab bound with steel tape to wooden pallets are delivered to the receiving dock by highway trucks and moved to the storage area and stacked by fork trucks. Workers charge the furnaces by placing ingot on a sloping trough leading to the well. Skip hoists lift remelt from the basement and dump it on a large sloping trough

Hydraulic presses at nearly every casting machine trim gating metal from cast parts



Trimmed rocker arm shaft supports are run on a vibrating screen to remove tramp metal

which also feeds the well. Every 8 hours sufficient flux is added to the melt to provide ¼-lb for each square foot of metal surface. Molten aluminum is tapped at 1380-1400° F into 1000-lb ladles lowered by a monorail metal carrier into a well in front of each furnace.

Melting furnaces are located at the base of the U-shaped monorail. Induction holding furnaces, diecasting machines, and trim presses are placed along the inside of the legs of the U. A metal carrier operating on the monorail supplies holding furnaces stationed at each of 22 diecasting machines. All holding furnaces hold 800 lb of aluminum at 1180 to 1220° F.

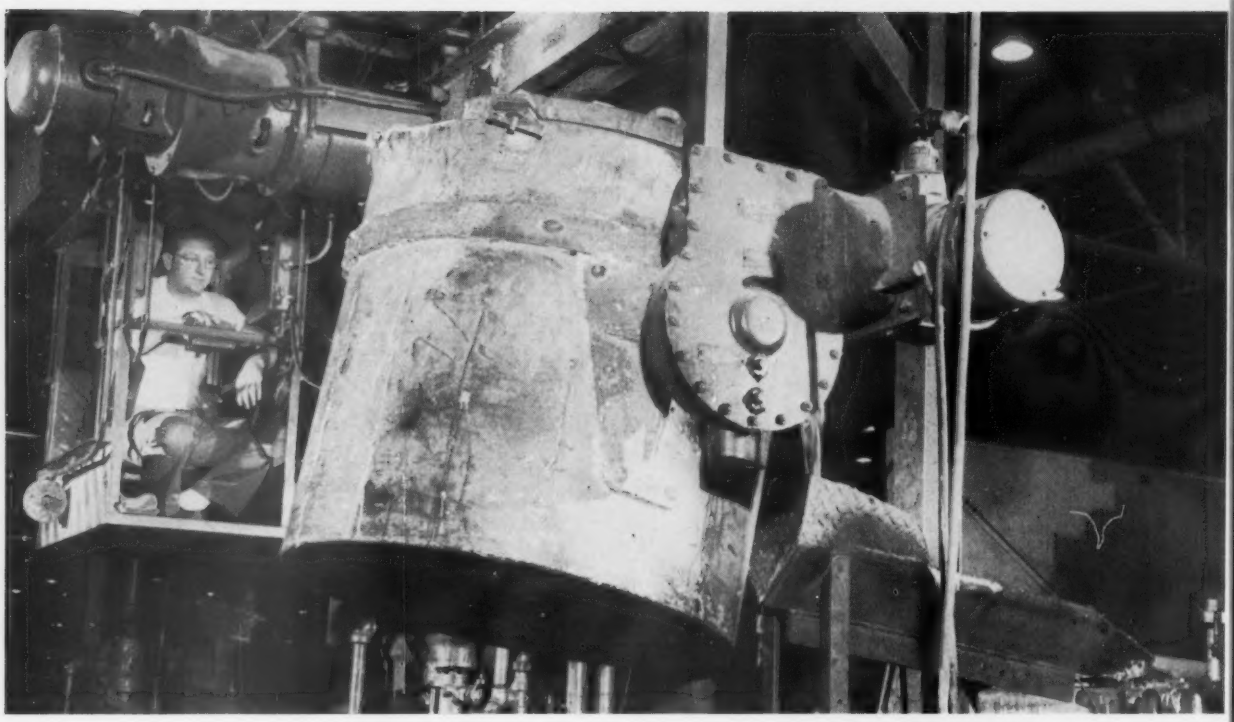
Casting machines are cold-chamber units, and the various makes employed have locking pressures of 350, 450, and 800 tons. They produce an average of 100 shots an hour and use single or multiple cavity dies, depending on casting size. One worker operates each machine, hand-ladling aluminum into the die and removing the casting to a metal trough. Stacks of castings are pushed along the trough to a hand-fed hydraulic trim press. Generally a trim press serves each casting machine.

Trimmed castings are pushed off the press to a chute which feeds a portable flight conveyor emptying into a drop-bottom tote box on the floor. Gating metal is tossed into a second chute which empties into a drop-bottom tote box in the basement. When filled, these boxes are emptied by fork lift trucks into buckets on the skip hoists which charge remelt into the melting furnaces.

Additional fork trucks on the main floor move box loads of castings to the tumbling area where castings are run over a vibrating screen to remove tramp gating metal. Castings fall from the screen to a scoop suspended from a monorail hoist and carried to the machines where castings are tumbled dry to remove flash. Drop-bottom boxes receive tumbled castings and are transported to elevated stands at various machining locations. Gravity chutes feed castings to machine operators.

Machined castings are placed on overhead monorail conveyor carriers for movement through a 50-ft long cleaning chamber. Here they are spray-washed with a solution of 13 per cent caustic material in 180° F water, followed by a spray rinse in clear water at 180° F, then dried with forced air at 160-180° F. The conveyor then continues to the packing area where the castings are unloaded, inspected, and put in cartons or boxes for movement to other departments or shipment to other plants.

Zinc Foundry Operations—Zinc castings are produced at a rate of approximately 75,000 daily. Pure slab zinc is alloyed with an aluminum-rich addition to achieve an alloy equivalent to SAE 903 or 925. Melting is done in six 6900-lb tilting induction furnaces. Furnaces are arranged in two rows of three and tilt inward toward the center aisle. Virgin metal is prepared in one row of furnaces; remelt metal is melted in the other three furnaces. The remelt furnaces are charged by skip hoist and chute in a manner similar to that used in the aluminum foundry. Virgin metals are raised by lift



Monorail carriers transport molten metal to holding furnaces at casting machines. Metal is poured into troughs which supply each holding furnace

truck to an elevated platform around each of the other furnaces and charged by hand.

An overhead monorail, molten-metal carrier passes through the aisle between the furnaces. The carrier ladle is lowered to receive virgin and remelt metal simultaneously from two furnaces. Tapping temperature is 930° F. The metal carrier is propelled along a U-shaped monorail as in the aluminum foundry and supplies 11 induction holding furnaces along each leg of the U. Metal in the holding furnace is kept at 780 to 820° F, and each furnace supplies metal to a diecasting machine. Furnaces of 1800 lb capacity serve 300-ton locking pressure casting machines, 2500-lb furnaces serve 450-ton machines, and the 800-ton machines are supplied by 5000-lb holding furnaces.

Zinc diecasting machines are submerged-plunger, hot-chamber units and average 200 shots an hour. Castings are pushed along metal troughs to trim presses. Gating metal falls through a chute to a box in the basement to be moved to the skip hoist furnace chargers by fork lift trucks. Cast parts are hooked onto carriers of an overhead monorail conveyor for movement to the machining area.

At the time of this writing, one of the zinc casting machines was being adapted to vacuum casting by mounting rubber seals on the platens. Among advantages expected to be realized from the experiment are the production of castings with a more uniform surface finish, thinner-walled castings, and reduction of the percentage of scrap castings due to porosity.

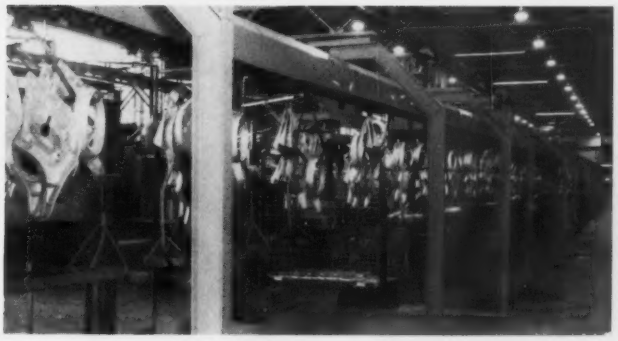
Finishing Operations — The monorail conveyor carrying zinc parts from the casting area lowers to waist-high level in the machining area. Workers unload castings for removal of flash with back-stand belt grinders and for machining on automatic equipment. Studs for mounting purposes are pressed into instrument cluster panels and tail and headlamp parts. These parts are loaded onto carrier shelves of an overhead monorail conveyor which carries them to the washing and painting area.

Other castings are unloaded from the casting area conveyor to tote boxes and are transported by fork trucks to tumbling machines and to buffing machines. Some castings are buffed on double-end stand machines; others are buffed on automatic machines which handle 450 to 600 parts an hour. Buffed parts are hooked on hangers of an overhead monorail conveyor which carries them through a cleaning chamber where they are spray-washed with a caustic-water solution, rinsed, and dried. The conveyor continues to the automatic chrome plating machine loading area.

Castings arriving by monorail conveyor at the washing and painting area are unloaded to storage baskets or to carrier hooks on either of two monorail conveyors. One carries parts such as tail and headlamp units, which receive a prime coat of paint. The other handles instrument cluster panels and steering column brackets, which are to be bonderized. Both conveyors carry castings through successive chambers for spray washing and rinsing, phosphate coating, rinsing, a chromic acid spray, and

Automatic machines perform finishing operations on parts cast in either aluminum or zinc

Presses insert mounting studs in head and tail lamp parts and instrument cluster panels



Trimmed zinc castings are carried to machining area on hooks of an overhead monorail conveyor

a 400° F dry-off oven. The prime coat conveyor then carries parts down into an 800-gal dip tank of black paint, through a drip-off chamber and into an oven for a 37-minute bake at 250° F.

The bonderizing conveyor is unloaded in the same area. Steering column brackets are trucked to the shipping room, and instrument cluster panels are hung on a third monorail conveyor for travel through two water-curtained hand spray painting booths. Each panel receives four spraying operations, including a final coat in one of eight colors, on a single pass. The conveyor then carries them through an oven where the paint is baked at 270° F for 29 minutes and on to the unloading area. Finished panels are packed for shipment to company assembly plants elsewhere in the country.

● An extra copy of this article is available until supply has been exhausted. Check Reader's Service Card, Page 51.

Short runs of castings are buffed on double-end machines. Automatic machines buff larger runs

Problems in Making

Stainless Steel Castings

This article discusses some of the problems encountered by producers of high-alloy castings—made of iron-chromium and iron-chromium-nickel alloys to resist heat, corrosion, or abrasion

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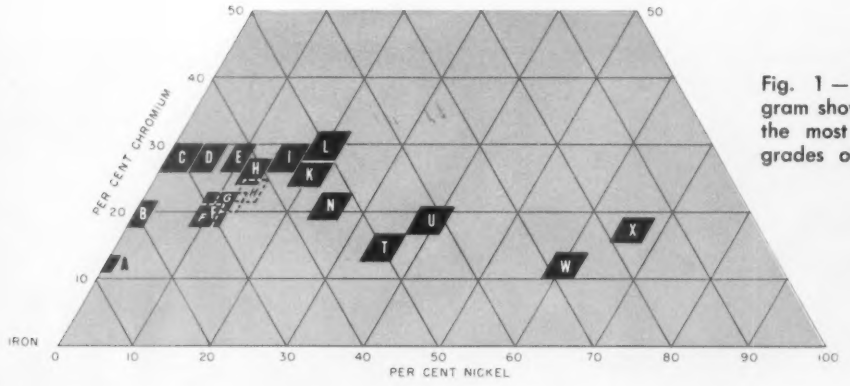


Fig. 1 — Ternary diagram shows location of the most widely used grades of high alloys

PROBLEMS of manufacture inherent in the casting process are familiar to all foundrymen, regardless of the metal involved. Physical characteristics of the various casting metals, nevertheless, have an important bearing on the severity of the problems encountered at different stages of production. They influence the techniques and equipment chosen to produce articles of commercially satisfactory and saleable quality.

End uses for castings also dictate quality requirements which, in turn, may impose or remove problems for the foundryman at every step from original design to final inspection. It is not surprising, therefore, that there is a tendency toward specialization in the class of metal handled in any given foundry.

This article will discuss some of the problems besetting the high-alloy foundryman. High-alloy castings are those made of the iron-chromium and iron-chromium-nickel alloys frequently referred to as stainless steel and used for heat, corrosion, and abrasion resistant applications. Excluded from this discussion are the corrosion-resistant high-silicon and high-nickel irons, the abrasion resistant high-manganese steels, and the heat-resistant multi-component, so-called "super alloys"—there are problems enough in the group selected.

Multiple Compositions a Problem—One of the chief problems faced by a foundry regularly engaged in high-alloy production is the number of widely differing compositions it may be called upon to produce. There are some 17 generally recognized standard grades of corrosion-resistant alloys, 14 heat-resistant, and about 6 abrasion-resistant types. Including modifications of the foregoing, together with wholly different special alloys, there are 15 abrasion-resistant, 36 heat-resistant, and 56 corrosion-resistant compositions reported by the industry in 1956, or a total of 107 different, closely controlled alloys. The range of demand for these materials may be measured by the fact that just one 19-pound casting constituted the entire annual output in one corrosion-resistant composition—but millions of cast-

ALLOY CASTING INSTITUTE

Standard designations and chemical composition ranges for heat and corrosion resistant castings

CAST ALLOY DESIGNATION	Composition — per cent (balance Fe)							
	C	Mn max.	Si max.	P max.	S max.	Cr	Ni	Other Elements
CA-15	0.15 max.	1.00	1.50	0.04	0.04	11.5-14	1 max.	Mo 0.5 max.†
CA-40	0.20 - 0.40	1.00	1.50	0.04	0.04	11.5-14	1 max.	Mo 0.5 max.†
CB-30	0.30 max.	1.00	1.00	0.04	0.04	18-22	2 max.	—
CC-50	0.50 max.	1.00	1.00	0.04	0.04	26-30	4 max.	—
CE-30	0.30 max.	1.50	2.00	0.04	0.04	26-30	8-11	—
CF-4	0.040 max.	1.50	2.00	0.04	0.04	17-21	8-12	—
CF-8	0.08 max.	1.50	2.00	0.04	0.04	18-21	8-11	—
CF-20	0.20 max.	1.50	2.00	0.04	0.04	18-21	8-11	—
CF-4M	0.040 max.	1.50	1.50	0.04	0.04	17-21	9-13	Mo 2.0-3.0
CF-8M	0.08 max.	1.50	1.50	0.04	0.04	18-21	9-12	Mo 2.0-3.0
CF-12M	0.12 max.	1.50	1.50	0.04	0.04	18-21	9-12	Mo 2.0-3.0
CF-8C	0.08 max.	1.50	2.00	0.04	0.04	18-21	9-12	Cb 8xC min., 1.0 max., or Cb-Ta 10xC min., 1.35 max.
CF-16F	0.16 max.	1.50	2.00	0.17	0.04	18-21	9-12	Mo 1.5 max., Se 0.20-0.35
CF-16Fa	0.16 max.	1.50	2.00	0.04	0.20-0.40	18-21	9-12	Mo 0.40-0.80
CH-20	0.20 max.	1.50	2.00	0.04	0.04	22-26	12-15	—
CK-20	0.20 max.	1.50	2.00	0.04	0.04	23-27	19-22	—
CN-7M	0.07 max.	1.50		0.04	0.04	18-22	21-31	Mo-Cu
HA	0.20 max.	0.35-0.65	1.00	0.04	0.04	8-10	—	Mo 0.90-1.20
HC	0.50 max.	1.00	2.00	0.04	0.04	26-30	4 max.	Mo 0.5 max.†
HD	0.50 max.	1.50	2.00	0.04	0.04	26-30	4-7	Mo 0.5 max.†
HE	0.20 - 0.50	2.00	2.00	0.04	0.04	26-30	8-11	Mo 0.5 max.†
HF	0.20 - 0.40	2.00	2.00	0.04	0.04	19-23	9-12	Mo 0.5 max.†
HH	0.20 - 0.50	2.00	2.00	0.04	0.04	24-28	11-14	Mo 0.5 max.† N 0.2 max.
HI	0.20 - 0.50	2.00	2.00	0.04	0.04	26-30	14-18	Mo 0.5 max.†
HK	0.20 - 0.60	2.00	2.00	0.04	0.04	24-28	18-22	Mo 0.5 max.†
HL	0.20 - 0.60	2.00	2.00	0.04	0.04	28-32	18-22	Mo 0.5 max.†
HN	0.20 - 0.50	2.00	2.00	0.04	0.04	19-23	23-27	Mo 0.5 max.†
HT	0.35 - 0.75	2.00	2.50	0.04	0.04	13-17	33-37	Mo 0.5 max.†
HU	0.35 - 0.75	2.00	2.50	0.04	0.04	17-21	37-41	Mo 0.5 max.†
HW	0.35 - 0.75	2.00	2.50	0.04	0.04	10-14	58-62	Mo 0.5 max.†
HX	0.35 - 0.75	2.00	2.50	0.04	0.04	15-19	64-68	Mo 0.5 max.†

† Molybdenum not intentionally added.

ings made up the millions of pounds produced in a popular heat-resistant grade.

The ranges of iron, chromium, and nickel for the compositions most widely used are shown in Fig. 1 and identified with a letter that is assigned to each grade as part of the Alloy Casting Institute system of nomenclature. Many of these grades have wrought alloy counterparts, and it is one of the problems of high-alloy manufacture that the less sophisticated users place orders for castings to be made, for example, in "type 304" or "type 316" alloy. Such type numbers are applicable to wrought material, so the composition ranges covered are designed for good rollability; castability is not considered.

On the other hand, the casting alloy designations of the ACI—also used by ASTM for high-alloy casting specifications—are for compositions balanced to provide castability and optimum corrosion or heat resistance. These designations, through the use of an initial letter "C" or "H," indicate whether the alloy is for corrosion or high-temperature service and may also show carbon content as well as special additional alloy elements. Thus, "CF-8M" is an alloy for corrosion-resistant service, of the molybdenum-containing, 19 per cent Cr, 9 per cent Ni type, with a maximum carbon content of 0.08 per cent.

A Tailor-Made Product—No one company customarily produces castings in all these alloys. The multiplicity of grades is not the result of trivial alteration of standard compositions, but rather the need to tailor-make the alloy for the special severe service application in which the casting will be employed. It must not be overlooked that high-alloy castings are used for severe service conditions where, frequently, the casting must provide a highly specific combination of physical and mechanical properties and an ability to remain chemically inert in order for a process to be economically feasible. Naturally, such exacting applications demand close control of all foundry operations for the production

of acceptable castings, and intimate knowledge of a customer's operation is also required. Because the application problems in corrosive aqueous media are, in general, quite different from those where high temperatures and gaseous corrodents are involved, and further because there is a distinct difference in the alloys used for such services, producers of high-alloy castings have tended to confine their operations to either the heat or corrosion resistant categories.

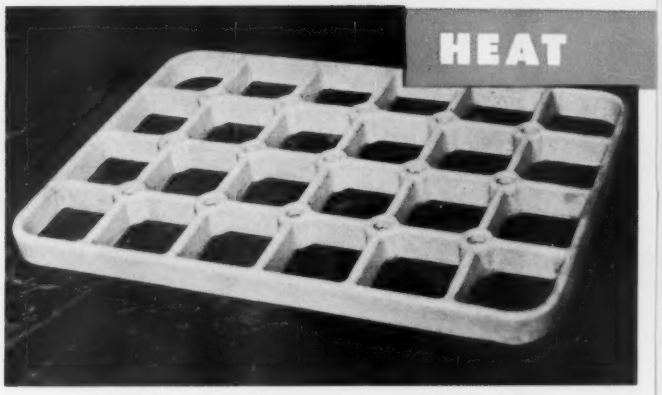
Concentration on one general field has these advantages: 1. It simplifies the sales problems by reducing the extent of detailed technical knowledge required by sales representatives. 2. It cuts down the number of different alloys handled in the shop. 3. It permits the establishment of more or less uniform quality standards to be applied to the usual run of work being processed.

Similar considerations have prompted most high-alloy casting producers, who also manufacture castings in other metals, to segregate their high-alloy operations either in an individual section of the main plant or in an entirely separate foundry where special melting, molding, cleaning, and inspection equipment and personnel can be devoted to making high-alloy castings only.

Uses of the Product—Liquid material handling and control equipment is the biggest use of corrosion-resistant castings. Pump casings and impellers, valves, fittings, mixers, etc., find many applications in the chemical industries where resistance to nitric, sulfuric, phosphoric, and other acids is required. Other users of considerable quantities of corrosion-resistant castings are the oil refiners, food processors, pulp and paper mills, textile dyers, and so on—wherever corrosive materials are encountered. Since many of these castings in service are retaining liquids under pressure, it is essential that they be of the highest quality with respect to soundness. Also the need for specific corrosion resistance means that extremely close control of chemical composition is imperative.

Most heat-resistant castings are used in industrial furnaces of various types as structural parts such as beams, brackets and the like, or as moving parts for conveying or containing material being processed in the furnace. Trays, conveyor belts, radiant tubes, and boxes are examples of castings used in heat treating furnaces. Oil refinery stills, refractory kilns, power plant boilers, jet engines, and guided missiles are also users of cast high alloys. Here again close control of compositions of many of the alloys is of great importance since their structure and consequent high-temperature strength are sensitive to the balance among the constituent elements.

Manufacturing Problems—Melting—Probably the biggest problem for a high-alloy melting department is the necessity to produce a large number of different, closely controlled alloys in small batches. Many melting practices, and the choice of equipment used, can be traced to this requirement. All high alloys are made in direct-arc or high-frequency electric furnaces. In the arc furnace both acid and basic practices are employed, while "neutral" or



amphoteric linings are generally used for induction melting.

For efficient operation many foundries find it convenient to have both arc and induction furnaces. One and two ton rated capacities are common for the arc type. Customary sizes for induction shells are 600 and 1000 pounds. There are, of course, both larger and smaller sizes of furnaces in use, and there is an increasing demand for heavier castings which require a substantial supply of molten metal. The disadvantage of the large furnace is that to obtain the minimum charge necessary one may have to wait a considerable time to accumulate sufficient orders in a particular composition to warrant making a heat—or else resort to the uneconomical practice of pigging a large amount of metal and thereby tying up expensive alloys in possibly unusable scrap. The usefulness of a small induction furnace in such circumstances is obvious.

Because the analytical specifications for these alloys are quite narrow, it is essential that the materials charged into the furnace be of known composition and free of contaminants. These conditions make careful control of scrap segregation mandatory. The selection of purchased scrap also is critical. Foreign materials introduced from outside scrap can be the cause of off-analysis heats, failure to meet mechanical property specifications, and defective castings. For example, it is reported that severe cracking is encountered in some compositions if as much as 0.001 per cent lead is present.

Recovery of alloy elements from virgin additions and from revert scrap is another melting problem. This is especially important with respect to chromium since this element is a major constituent of all stainless steels and is readily oxidized in the melting process. Alloys in which low-carbon content is not required, such as the heat-resistant grades, can be made with high percentages of scrap in the charge, but use of scrap is less convenient in the low-carbon corrosion-resistant alloys. Before the advent of the oxygen blowing technique very little scrap was used in melting alloys of 0.08 per cent maximum carbon content. They were made of essentially virgin charges of low-carbon materials. The use of gaseous

Fig. 2 (left)—Cast high alloy (type HT) trays used to support gears in carburizing furnaces are rigid but lightweight. Fig. 2 (above)—Oil refinery tube supports cast in type HH high alloy

oxygen for decarburization has permitted the use of much larger quantities of scrap, however, and this is a boon to the corrosion-resistant casting producers because the low yield (around 32 per cent from charge) customary for such castings means the rapid accumulation of revert scrap.

Critical control of furnace temperature is necessary when using oxygen so that excessive oxidation of the chromium will not occur. High temperatures are required for rapid removal of carbon with minimum chromium loss. Even at best something like 30 per cent of the chromium at melt-down will be oxidized and pass into the slag during the blow. In acid practice little of this chromium can be recovered. For this reason, despite the lower cost of acid linings, many corrosion-resistant alloy producers are turning to basic practice where the extra cost of the lining is offset by the greater recovery of chromium made possible.

Aside from reduction of carbon, the oxygen blow has the virtue of acting to scavenge the metal of dissolved hydrogen and nitrogen. It has been established in Alloy Casting Institute research that dissolved hydrogen is the cause of a type of defect known as "worm-hole" porosity. The combination of conditions that result in gas porosity in high-alloy castings is complex and involves many factors in addition to the amount of hydrogen dissolved in the metal—nevertheless, a low hydrogen content is good insurance against trouble. This requires careful handling of charge materials to insure that they are perfectly dry before going into the furnace. Condition of ladle linings, reladling in humid air, mold moisture and permeability, and pouring temperature all influence the incidence of porosity and demand precise control for quality casting production.

Molding and Coremaking—Molding and coremaking practices for high alloys are basically the same as for steel. Probably the greatest tonnage of alloy castings is made in green sand molds with oil-bonded cores. Certain castings are characteristically made in dry sand, others in skin-dried molds, and still others in all-core sand. The use of CO_2 cores and molds has been effective in many cases, and plastic binders have been employed successfully in cores for conventional and dielectric heating. Shell, ceramic, and investment molds all are used in the production of high alloys where the size, surface finish, dimensional tolerances, and quantity of castings required make one or another of these methods economical. In addition to static casting, high alloys are also centrifugally cast in permanent or sand molds on both horizontal axis and vertical axis machines.

Certain inherent characteristics of high alloys create problems in the molding department. These are: 1. Different shrinkages among the grades, (7/32 to 11/32 in). 2. Different thermal conductivities. 3. Various fluidities. 4. The development of high strength at high temperature.

The first item cited is probably the cause of greatest difficulty with new customers who want to use the pattern they had for a gray iron or brass part and expect to obtain the same size casting in a high alloy. This is not possible, of course, when the difference in shrinkage is considered. A primary rule is that the quality of the ultimate casting is directly related to the quality and suitability of the pattern equipment provided.

Different thermal conductivities among the grades also influence the suitability of patterns and casting designs. In general, high alloys have much lower conductivity than carbon steel, which results in the development of considerably steeper thermal gradients. These, in turn, create problems of directional solidification, gating and risering.

Some of the alloys, notably the iron-chromium types, have a tendency to form a sluggish oxide film that makes it difficult to run thin sections; others have excellent fluidity. All of the iron-chromium-nickel alloys develop high strength at high temperature and this characteristic makes it important that castings be designed to avoid restraint in the mold as much as possible. The combination of large contraction in the solid state, low thermal conductivity creating hot spots, and rapid development of strength soon after solidification is ideal for tearing the casting to pieces in the mold unless proper precautions are taken beforehand.

Cleaning Costs High—One of the most costly and

time-consuming operations in a high-alloy foundry is the removal of heads and gates. The variation in properties of the different grades permits use of a number of cut-off methods. Some are more efficient than others so that considerable effort to design the rigging without hard-to-get-at risers and ingates is rewarded by substantial cost saving.

The simple, fast and economical "knock-off" method can be employed with "neck-down" cores, but it can be applied only to the low-ductility, high-chromium-iron alloys. Arc burning, although used extensively in the past, is unimportant today. It is a slow process, requiring excessive heat, and removing a large amount of metal that frequently is spattered over the casting and necessitates additional cleaning before other operations can be started. Combined with an air blast, however, the arc is useful as a substitute for some grinding and chipping.

A widely used cut-off method is the oxyacetylene-powder torch. It introduces an iron powder into the flame and, in burning, the powder enables the oxygen to oxidize the base metal as in cutting carbon steel. The method is fast, cuts can be made with minimum positioning and precise cuts are possible. The inevitable disadvantages are 1) generation of excessive heat on the casting (it is sometimes necessary to preheat the casting and cut it hot), 2) evolution of large volumes of iron oxides that require removal from the casting and frequently from the risers also, to avoid contamination on remelting or the production of excessive slag in induction melting.

Abrasive cut-off wheels and high-speed friction saws are used for high-alloy riser removal, but the methods are not as flexible as burning since rigging must lend itself to the straight cuts required. Where applicable, abrasive cut-off is desirable because of the clean, precise cut possible, the low heat generation and the elimination of much or all grinding.

Grinding operations are performed with customary equipment but care must be exercised to avoid overheating the casting. The low thermal conductivity of the stainless steels otherwise can create problems of warping, heat checking, and progressive cracking. Repair welding and fabrication welding also present problems of warping and cracking as a result of the high thermal expansion coefficient acting in conjunction with the low thermal conductivity. All of the high-alloy grades can be welded successfully, however, if proper precautions are taken with respect to preweld and postweld heat treatments, and if recommended techniques are observed. Metal arc, inert gas arc, and oxyacetylene gas welding all are used depending on the alloy composition involved and the end use of the casting. Gas welding, for example, is desirable for nickel-predominant, heat-resistant alloys, but is not recommended for chromium-predominant corrosion grades because of carbon pickup that is detrimental to castings in corrosion-resistant applications.

Shot or grit blasting can be employed for heat-resistant grades. Unless a corrosion-resistant shot is used on the corrosion alloys; however, iron particles may become imbedded on the surface and must be removed by pickling before the castings are shipped. This difficulty may be avoided by sand blasting.

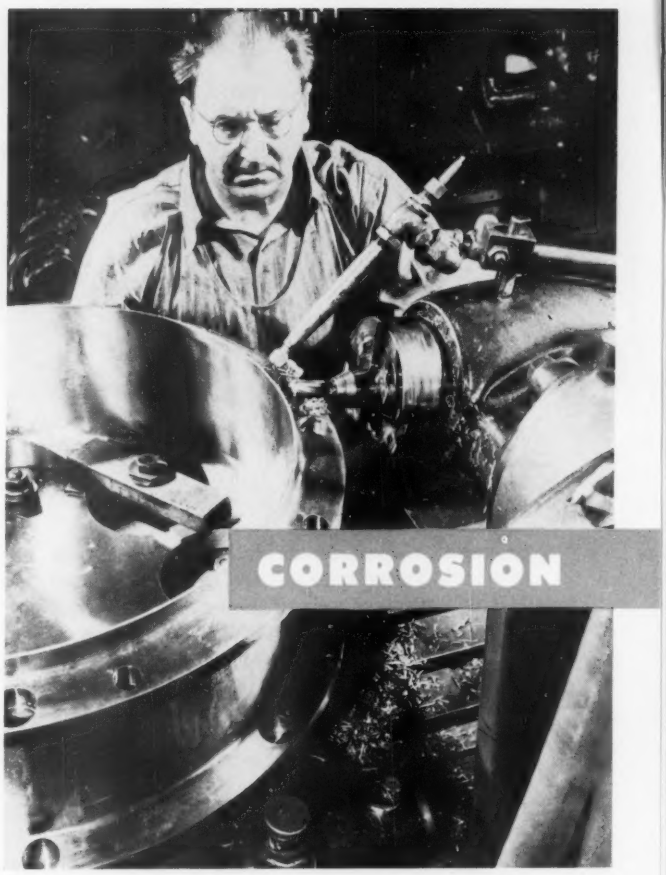


Fig. 4 (above) — Performing horizontal milling operation on milk filler tank made of type CF-16F cast stainless alloy. Fig. 5 (right)—Sanitary fitting made by Tri-Clover Machine Co. of CF-8 type cast stainless alloy is for use in production of terramycin by Charles Pfizer & Co.

Heat Treatment—Although few heat-resistant castings are heat treated before being placed in service, nearly all the corrosion-resistant grades require heat treatment of some sort. The martensitic 12 per cent chromium alloys are hardenable and a variety of mechanical properties can be obtained by combinations of quenching and tempering treatments. The ferritic straight chromium alloys are usually annealed at 1450-1600° F for improvement of mechanical properties. On the other hand, the austenitic grades require heat treatment for obtaining maximum corrosion resistance. They are not hardenable, but carbides precipitated in the as-cast structure must be put into solution by heating the casting to about 2000° F and then rapidly cooling the casting in water, oil, or air to avoid reprecipitation of the carbides. Postweld heat treatment can be omitted with several grades, but in general castings that are welded after heat treatment must be retreated to restore maximum corrosion resistance.

Inspection and Control—To be fully prepared to meet its customers' demands, a high-alloy foundry must be equipped with all the testing facilities necessary to determine compliance with specifications

covering chemical composition, mechanical properties, surface finish, internal soundness, and corrosion resistance. A chemical laboratory capable of rapid determination of carbon, manganese, silicon, nickel, chromium, molybdenum, columbium, and copper must be available. Some companies have found it advisable to install direct-reading spectrographic analyzers, whereas others use spectroscopic, colorimetric, volumetric, or gravimetric methods or a combination of several procedures.

Companies engaged in supplying corrosion-resistant castings frequently maintain equipment for corrosion tests such as the Huey boiling 65 per cent nitric acid test, the Strauss acidified copper sulfate test, and the oxalic acid test. Physical testing equipment for determination of magnetic permeabilities, thermal and electrical characteristics, and provision

for mechanical tests of tensile and impact properties are customarily part of the high-alloy foundry setup. Long-time testing of high-temperature strength is necessary; frequently this is carried on at outside laboratories, although several companies maintain their own equipment for such work. Incidentally, the ACI research program during the last 20 years has contributed much basic information on the chemical, physical and mechanical properties of the cast high alloys that has been helpful in delineating composition ranges for the various grades.

In addition to the foregoing tests for material qualifications, the foundries must be prepared to investigate the quality of individual castings with respect to surface and internal conditions. Nondestructive testing techniques used for internal inspection that contribute to effective quality control are liquid pressure, gas pressure, radiographic, and ultrasonic. Water pressure tests are common, but gas pressure tests such as the helium-leak test where the results must be analyzed by a mass spectrometer are still relatively rare. Ultrasonic testing also is little used, but radiography is employed widely both as an inspection tool and for pilot casting studies.

Sources of radiation are generated x-rays, naturally occurring radioactive material, or artificially produced radioactive isotopes. The x-ray units vary from small 50,000-volt portable machines to individually housed and permanently positioned betatrons producing 24 million volts. Many foundries find that gamma rays from radium or cobalt-60 are efficient for their needs. Slowness in obtaining pictures is a drawback, but the high energy of the rays and the portability and flexibility of positioning are assets, as is the low cost, especially of cobalt-60.

Surface inspection other than visual is made by magnetic particle or fluorescent oil methods depending on the magnetic properties of the alloy, or by the use of dye penetrants.

Problems of inspection are largely those of interpretation and judicious use of each inspection method. Too often tests are called for by the customer and accepted by the foundry without full understanding of the capabilities and deficiencies of the test method proposed. Divergence of opinion between consumer and producer is not surprising, nor is the demand for the highest possible quality obtainable in view of the critical nature of the installations in which many high-alloy castings serve. Some of the present difficulties will doubtless disappear when attention is directed toward establishing what is not bad quality, rather than solely what is believed to be good quality.

Demand Variations—Use of high-alloy castings has shown a steady long-term growth. The trend of design in processing equipment of all sorts is toward higher pressures, higher temperatures and the more corrosive conditions that accompany them. Thus the outlook for expanded demand for high alloys is bright, and there is no reason to believe that castings will not share in this demand. The very force—modernization of equipment—creating the demand, however, is a problem for the alloy casting industry. The force is intermittent.

As pointed out in the beginning, high-alloy castings are used in process equipment and are thus general industrial capital goods. Consequently, the high-alloy foundry must be prepared to have boom periods at the start of capital expansion programs, followed by declines to a replacement type of business while industrial activity as a whole may be at a peak, and then almost complete disappearance of demand when the mass-production industries curtail their output. Such a pattern can be traced through all past business cycles.

Despite the problems of the market-place, of the manufacturing process, and of quality control, foundries actively engaged in high-alloy casting production have found that with close attention to technical advances, adequate flexibility of production equipment and rigidly applied control and inspection techniques, they are able to meet the demands for high-quality castings now, and anticipate continuing to meet them in the future.

Editor's Note: This paper was presented before the Niagara Frontier Regional Foundry Conference held at Buffalo, Oct. 24-25.

● An extra copy of this article is available until supply has been exhausted. Check Reader's Service Card, Page 51.

Questions and Answers

Removal of carbon from pig iron in the electric furnace is time consuming . . . Gypsum or plaster of paris needs other additions for foundry use . . . Has leakage problem around chaplets . . . Runs into difficulty in core removal

Decarburization of Pig Iron

We are interested in studying a successful method of obtaining a pig iron decarburized in the electric furnace process. In this connection we think that some kind of decarburizer will be employed in this operation. Will you tell us what materials are used in your country for that purpose, and who supplies them?

Your inquiry is not clear to us, but possibly it may mean production of steel or low carbon cast iron. To produce steel in the electric furnace with a charge of all pig iron would be much more expensive than when the major portion of the charge is steel scrap. In addition to the adverse price differential, it would take much longer to reduce the high carbon content of pig iron to the desired point and require more oxidizing material than in the case of the lower carbon content of steel scrap with some pig.

Carbon content in production of steel is reduced by addition of iron ore or mill scale or lancing with oxygen. If the basic-lined furnace is to be used, and presumably it will be in this all-pig operation, probably some 30 to 40 per cent of the initial carbon will be eliminated in the lime boil with the addition of 6 to 8 per cent limestone in the charge. As a consequence, less ore or mill scale will be required to reduce the remaining carbon to the desired point. Amount of ore to be added will depend, of course, on not only the quantity of carbon to be removed, but also on the amounts of silicon, manganese, and phosphorus eliminated during the oxidation period or boil.

Stoichiometrically the amount of ore can be determined, but some of the calculations can be reduced by using the following, termed oxygen equivalents, or the amount of oxygen required to oxidize a given amount of the element: For 1 lb Si, 1.140 lb O is required; for 1 lb Mn, 0.291 lb O; for 1 lb P, 1.291 lb O, and for 1 lb C, 1.332 lb of O is required. Rough calculations indicate that a pig iron containing 1.50 per cent Si, 3.50 per cent C, 0.50 per cent Mn, and 0.10 per cent P would require considerable ore to produce a steel containing 0.25 per cent C and 0.03 per cent P. The procedure would be to add it in several steps beginning with some in the charge, just after melt down, etc. The additions should provide a continuous, vigorous boil, but not a violent one which is likely to ensue with large ore additions.

A cast iron of lower carbon content than that available in the pig iron can be obtained by melting in the electric furnace and subjecting the molten material to sufficiently high temperature to create a mild carbon boil. Period of time that the iron is held at the temperature will determine the reduction in carbon content. The same result could be obtained, of course, by adding sufficient steel scrap in the charge to produce an iron with the desired carbon content.

Wants Information on Plaster

One of our correspondents abroad is interested in using a high-grade plaster of paris in his foundry. He refers to matchplate molding in the United States which is the right technique for matchplate production based on the method of pressure casting aluminum patterns in plaster molds. What he has in mind is a high-grade and high-strength plaster with ample permeability. Can you suggest names of suppliers of such plaster?

Plaster of paris or gypsum for use in the foundry field is available in prepared form from several producers. It contains about 25 per cent fibrous talc, a fibrous steatite known as agalite, and a small amount of terra alba or china clay to control the setting time. This material is termed "casting plaster."

Some foundries purchase the components separately and do their own mixing. Since the plaster is to be shipped abroad, it might be advisable to purchase the material in prepared form to eliminate separate packaging, etc.

A few years ago a special plaster containing foaming agent was developed for certain applications. With this type, air is whipped into the plaster during the mixing with water which results in the presence of numerous small air bubbles in the plaster after "setting." These voids are claimed to provide much higher permeability than in the case of conventional plaster. The small bubbles, of course, do not penetrate to the face of the mold cavity.

Chaplets Tend To Cause Leaks

We manufacture a line of vacuum and condensate pumps with tanks or receivers of gray iron. The latter range from 10 x 15 x 15 in. to 20 x 33 x 59 in. with wall thicknesses from 3/8 to 1/2 in. The tanks must be leakproof. Considerable core work is employed, and from 4 to 8 stem anchors are used to hold the cores in place. We encounter leakage around the stem anchors and sometimes in porous sections of the casting. Leaks usually are seepage type, but must be repaired before shipment. Can you suggest methods to insure more successful knitting or bonding of the iron to the anchors and elimination of the porous sections in the areas around the anchors? As complete elimination of all leaks is impossible, we would like to know of any processes available for sealing—in particular a procedure whereby the sealing would be accomplished by a water-soluble agent in the final hydrostatic test line.

Difficulty with chaplets not fusing properly usually is due to the chaplets not being clean, or to low temperature of the iron poured against them, or, what amounts to the same thing, to chaplets too heavy for the metal section. Porous areas around the chaplets are caused by dirty chaplets. Sometimes the porous areas result from moisture condensa-

tion on chaplets which are cold when set, and the mold is closed and allowed to set for some time before pouring.

Number and size of chaplets can be ascertained from information presented in Dietert's *Foundry Core Practice*. With a figure for the lifting power of the core, the number and size of chaplets are selected from a table indicating the loading certain size chaplets will withstand safely when used with gray iron.

For stem chaplets the table states that a $\frac{1}{8}$ in.-diam-chaplet will withstand a load of 20 lb; 3/16-in. diam, 45 lb; $\frac{1}{4}$-in. diam, 80 lb; $\frac{3}{8}$-in. diam, 180 lb; $\frac{1}{2}$-in. diam, 320 lb, and $\frac{5}{8}$ in. diam, 500 lb. This is for thin metal, and for heavy metal the indicated values are halved. The values given indicate a compressive strength of 1630 psi for the chaplets in thin metal and 815 psi in heavy metal.

Lifting power of the core, according to Dietert, is 3.5 times the weight of the core. If the weight of the core is not known, the volume can be determined and multiplied by 0.06, the weight of a cubic inch of sand. With information on lifting power of the core, and the load a given chaplet will withstand, the number of chaplets can be determined. Where difficulty is encountered in obtaining satisfactory fusion, it is advisable to select a smaller diameter chaplet and increase the number.

A number of practices are employed for sealing porous areas in hollow castings. One of the older methods was to use a solution of sal ammoniac, which is forced through the porous area under pressure, but now water-soluble as well as other types of sealing agents are available which are claimed to function more effectively.

Application of one of the water soluble materials is described in "Foundry Impregnates Entire Production" in the April, 1956, issue of FOUNDRY. While the application is to automotive cylinder blocks, it should not be difficult to adapt the procedure to your type of castings. Names and addresses of suppliers of sealants and equipment may be found in the advertising section of FOUNDRY.

Has Trouble in Core Removal

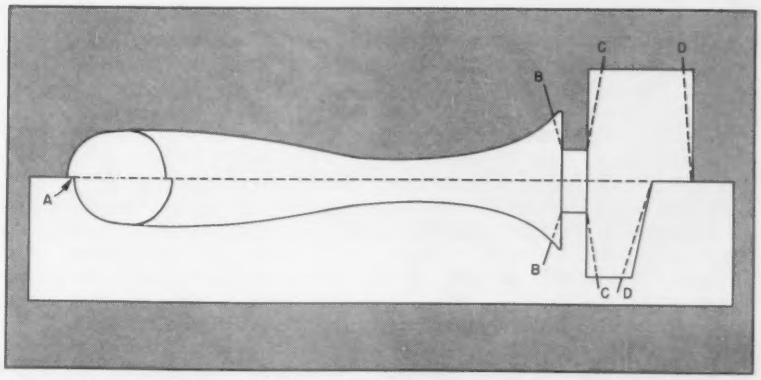
We are sending you an aluminum stove burner casting and two resin-bonded cores used to produce such burners. Our problem is knockout of the cores from the castings. We are converting from oil-bonded cores to the resin-bonded type, and have tried from 1½ to 4 per cent resin with sands from 58 to 100 grain fineness. Curing time has been varied from 12 to 30 seconds with the box temperature from 425 to 600° F. With 1½ per cent resin and 58 grain fineness sand, we have some difficulty with breakage when the cores are removed from the corebox. Recently we heard that an addition of wood flour to the sand will help knockout, but we have not tried it as we do not know how much to add.

While you did not mention the particular core mix employed for the cores submitted for examination, we suspect that it contains the highest of the resin range mentioned since it did not break easily. Your difficulty with core knockout is due to the low heat capacity of aluminum which does not destroy the bond and permit the sand to flow out. The remedy is to use the least possible amount of binder so that it may be effectively destroyed and thus result in disintegration.

Although you did not say specifically that the cores with 1½ per cent binder content did not cause trouble in knockout, the assumption is that no difficulty was encountered except that of breakage in removing the cores from the boxes. That trouble, we suspect, originates in the corebox since examination of the cores shows a poor match between the two halves, resulting in a slight shift. In one half the section forming the top of the T-shape is practically vertical, and not rounded as in other similar areas. It may be that this conformation is just enough to cause a slight sticking which does not show up with strongly bonded cores.

One way to determine whether or not that condition has any effect is to make some of the 1½ per cent resin bonded cores in the box, and observe whether the core has a tendency to stick or remain in one half rather than the other. If it does, carefully remove the core, watching for any tendency to bind. Then make the necessary corrections to the contour to eliminate the binding.

We have no doubt that if the drawing of the core in relation to the cavity in the box were practically vertical, little trouble would be encountered from breakage. From the shape of the core with the heavy print on one end, however, we believe that the operator tends to grasp it in removing the core, resulting in a slight rotary movement as indicated on the accompanying sketch with the pivot at point A. The core shift offset and the vertical contour at that point tend to bind, and the core breaks at the smallest section. We suggest that the contours of the corebox at points A, B, C, and D, be worked on to provide the necessary clearances. Possibly correction at points A and D alone may be the solution.



Mismatch in the corebox halves may cause breakage when removal is attempted

Perhaps part of your difficulty with core breakage may be that the operator tries to make too many cores between application of the release agent on the corebox. Excess application is wasteful, of course, but more frequent application is less expensive than core breakage.

Although wood flour is added to core and molding sand mixes to aid in collapsibility, that property results essentially from burnout of the material which leaves a more open or porous sand body. Since your problem is lack of sufficient heat in the casting to burn out the resin, it hardly seems likely that addition of more material to be burned out will help. If you want to determine the effect of wood flour additions, try up to ½ per cent.

Furnace Will Do Double Duty

We produce both gray iron and steel castings, and have decided to increase output of the latter by converting one of the bays to the manufacture of small steel castings. We have purchased a 5-ton electric arc furnace to make the steel in the converted bay. Its potential output is considerably greater than is required for the steel castings, and we are wondering if we could use the same furnace to produce gray iron for the remaining iron foundry, and so do away with the existing cupola plant.

Do you have any comparative figures on cost of iron melted in the electric furnace and in the cupola? We appreciate that our labor, material and electricity cost will be different than yours, but any comparative figures would be of assistance. Also, what is the quality of iron produced in the electric furnace compared with normal cupola iron?

Since the direct-arc electric furnace functions equally well for production of gray iron and steel, your new furnace can serve both foundry divisions. Although, according to meager information, melting cost in the arc furnace is much higher than in the cupola, that may be overcome in a number of ways. One is to use lower cost metallic charges. The other is to take advantage of the ease in control of composition and temperature to produce irons of consistently uniform properties which will result in better castings, in lower losses, and possibly premium prices.

As to comparative figures, we can only refer you to an article by A. W. Gregg entitled "Iron Melting Costs in the Cupola and Electric Furnace" which appeared in the February, 1949, issue of FOUNDRY. The author compared costs for an annual production of 15,000 tons (short) of gray iron by both methods. The cupola installation included a 10-ton cupola melting 60 tons a day, blower, skip charger, coke and limestone bins, and a yard crane with a 100-ft runway at a cost of $67,600. On a 20-year depreciation basis, the cost figures at $0.23 per ton of iron.

Other figures include coke at $20 a net ton, with 6:1 ratio or $3.33 per ton of metal; limestone at $3 a net ton, 100 lb per ton or $0.15; electric power at 1 cent a kwh, 5 kwh per ton or $0.05; operating labor, four men at $48 a day or $0.80 a ton; oil for heating ladles $0.10; refractory materials $0.50; miscellaneous maintenance labor $0.10; soda ash at $0.013 per lb, 10 lb per ton or $0.13, and depreciation $0.23. The total without any other charges amounts to $5.39 per ton.

For electric furnace melting the equipment includes a 6-ton top-charge furnace, two charging buckets, and yard crane with 100-ft runway at a cost of $126,000. On a 20-year depreciation basis and 15,000 ton annual production, the cost per ton is $0.42. The author points out that the furnace will melt 60 tons in 20 to 22 hours in three-shift operation. Other figures include electric power at $1.01 per kwh, 500 kwh per ton or $5; electrodes at $0.17 per lb, 10 lb per ton or $1.70; operating labor, three helpers at $350 per month, three helpers at $1.50 per hour and three cranemen at $1.50 per hour, or $2.04 per ton; maintenance labor $1.00; oil for heating ladles and preheating furnace lining $0.10; cooling water $0.10, and depreciation $0.42. The total without any other charges included amounts to $10.61.

Although those figures indicate that electric furnace melting costs nearly twice as much as cupola melting, the differential between them could be reduced or eliminated by using lower cost material charges in the electric furnace. For example, using 30 per cent pig iron and 70 per cent scrap in the cupola with pig at $62.50 a ton, and scrap at $40 a ton, the cost of metal at the spout would be $52.14. In the electric furnace, using all scrap at $40 per ton with the addition of 5 lb ferrosilicon and 2 lb ferromanganese (briquets), the cost of metal over the spout would be $53.41. Thus the change in metallic charges in the melting units makes the differential only $1.27.

It might be pointed out that for gray iron operation where the base composition remains the same, continuous melting can be established by scheduling cold metal additions to the molten bath as hot metal is tapped, and allowing a short period to bring it to temperature. One foundry in this country adds 1500 lb cast iron borings every 10 minutes to a 6-ton furnace.

The close control of composition and temperature provided by the electric furnace makes it possible to produce gray irons with a wide range of properties, and to do so consistently. Low-carbon irons can be made by use of steel scrap or by application of the carbon "boil," and high-carbon irons by the addition of carbonaceous materials with the charge. Alloying agents may be added in the furnace or in the ladle.

Casting Statuary Bronze

We are interested in obtaining more information on the process of lost wax casting of miniature statuary bronzes. Can you supply that?

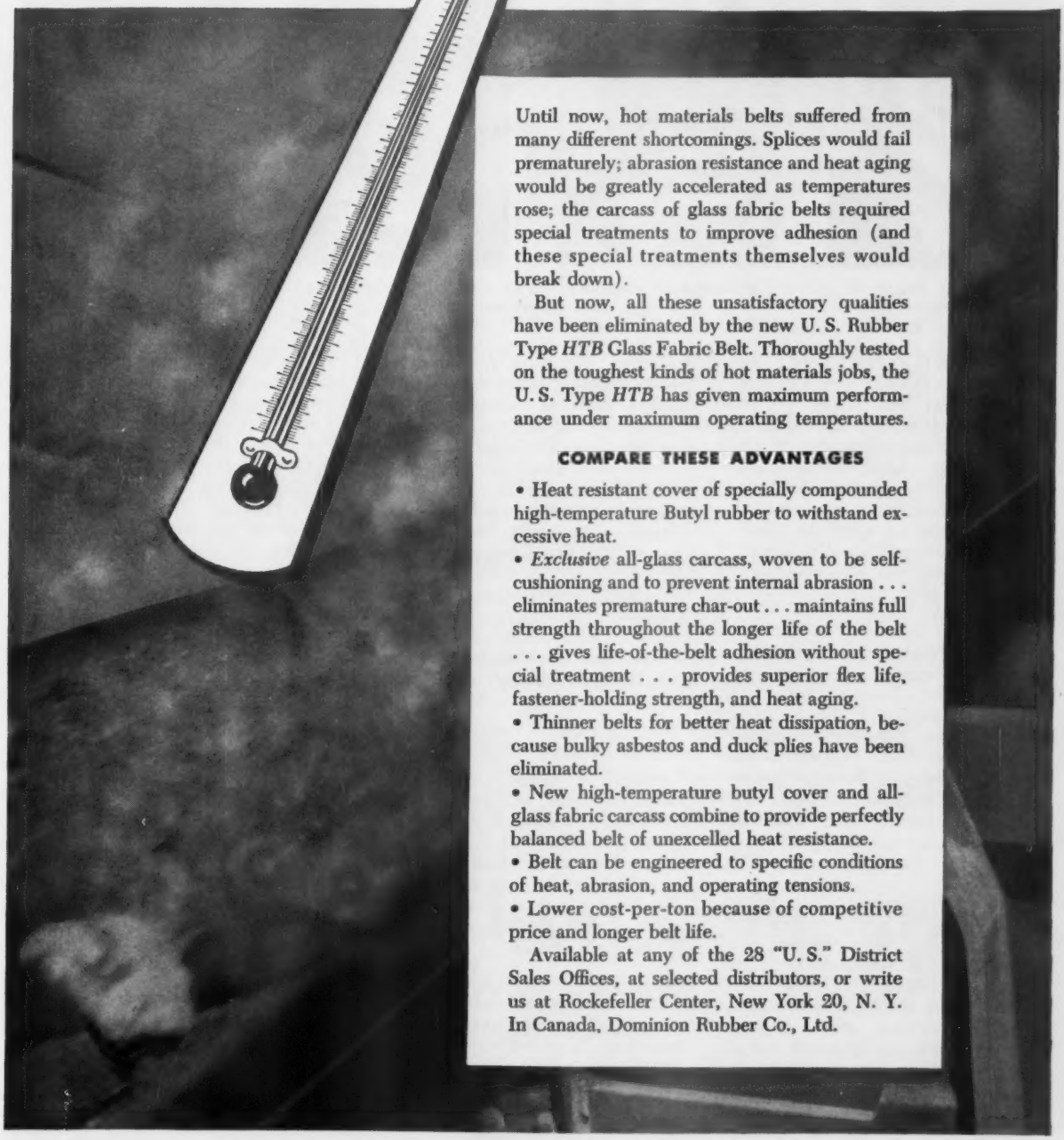
For detailed information relating to the lost wax process—or investment molding, as it now is termed—we suggest that you obtain a copy of *Investment Castings for Engineers* by Wood and Von Ludwig. While it is concerned mainly with application of the process to the production of castings with close dimensional tolerances, the principles are basic, and can be adapted to your needs.

Investment molding is a somewhat expensive method of producing castings, and it appears to us that for your purpose a less costly process would serve. For example, plaster molding will provide excellent reproduction and smooth surfaces. In that process you can make a master mold from the original miniature statue for use in either of two ways.

One method would be to use the master to make wax replicas, which can be invested or surrounded with casting plaster. The wax then is melted out, and the cavity filled with molten metal. The other and preferable method would be to make plaster obverses from the master mold halves. The obverses then become patterns for turning out plaster molds to be filled with metal. Such a method eliminates the step of making expendable wax patterns.

CONVEYOR BELTS

Turn on the Heat this Belt can take it!



Until now, hot materials belts suffered from many different shortcomings. Splices would fail prematurely; abrasion resistance and heat aging would be greatly accelerated as temperatures rose; the carcass of glass fabric belts required special treatments to improve adhesion (and these special treatments themselves would break down).

But now, all these unsatisfactory qualities have been eliminated by the new U. S. Rubber Type *HTB* Glass Fabric Belt. Thoroughly tested on the toughest kinds of hot materials jobs, the U. S. Type *HTB* has given maximum performance under maximum operating temperatures.

COMPARE THESE ADVANTAGES

- Heat resistant cover of specially compounded high-temperature Butyl rubber to withstand excessive heat.
- *Exclusive* all-glass carcass, woven to be self-cushioning and to prevent internal abrasion . . . eliminates premature char-out . . . maintains full strength throughout the longer life of the belt . . . gives life-of-the-belt adhesion without special treatment . . . provides superior flex life, fastener-holding strength, and heat aging.
- Thinner belts for better heat dissipation, because bulky asbestos and duck plies have been eliminated.
- New high-temperature butyl cover and all-glass fabric carcass combine to provide perfectly balanced belt of unexcelled heat resistance.
- Belt can be engineered to specific conditions of heat, abrasion, and operating tensions.
- Lower cost-per-ton because of competitive price and longer belt life.

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Mechanical Goods Division

United States Rubber

Circle 614 on Page 51

Men of Industry

● MORRIS E. NEELEY JR.
. . . heads Castings Branch

● ARTHUR W. KURZ JR.

● LOUIS J. PEDICINI

Tann Corp. division appointments

● DAVID T. MARTIN
. . . CWC sales staff

MORRIS E. NEELEY JR., sales manager, Dodge Steel Co., Philadelphia, has been granted leave for six months to serve as chief, Castings Branch, Business and Defense Services Administration, Department of Commerce, Washington. He joined Dodge Steel in 1942, became purchasing agent the following year, entered the sales department in 1946, and was made sales manager in 1955.

Ralph Hippler, vice president-general manager, Detroit Gray Iron Foundry Co., Detroit, has been elected a member of the board of directors. He joined the company 16 years ago. Mr. Hippler is also president, Oakland Foundry & Machine Co., Rochester, Mich., and Lansing Foundry Co., Lansing, Mich., company subsidiaries.

Ludwig Anselmini recently joined the staff of the Stainless Steel and Heat Resistant Alloys Section, Development and Research Div., International Nickel Co., New York, where he will specialize in corrosion and heat-resistant alloy castings. Until recently he directed metallurgical engineering research at Republic Aviation Corp., Farmingdale, N. Y.

Arthur Neiman has been appointed Cleveland district manager, Sipi Metals Corp., Chicago. He has been active in the nonferrous field throughout the Cleveland area for over 40 years.

• **Arthur W. Kurz Jr.** has been named manufacturing manager, and **Louis J. Pedicini,** manager of manufacturing engineering, Congress Die Casting Div. and Congress Drives Div., Tann Corp., Detroit. Until recently Mr. Kurz was general manager, Advance Plating Co., Detroit. Previously he was with Continental Die Casting and Dolphyn Engineering, both of Detroit, and Hunt Machine Co., Greenville, S. C. Mr. Pedicini has been associated with General Motors Corp. on the process development staff and more recently as staff engineer in charge of the metal casting department.

Murray I. Glickman has been named manager, and **Jerald L. Kafker** assistant manager of the Boston office, Luria Bros. & Co., Philadelphia. **Morris B. Kafker,** former Boston office manager, who recently completed 43 years of service, will continue with the company as a consultant and advisor.

L. D. Reiff was recently appointed general manager-manufacturing operations, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., in addition to his duties as vice president.

Harold E. Erf has been appointed Chicago district sales manager, Sterling Grinding Wheel Co., Tiffin, Ohio. He was formerly manager of sales administration for the company.

• **David T. Martin,** until recently general sales manager, Central Foundry Div., General Motors Corp., Saginaw, Mich., has joined the sales staff of Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich. During 21 years with Central Foundry Div., Mr. Martin served as executive sales engineer, director of quality control, and supervisor of customer services.

Theodore H. Harley was recently named president, Vesuvius Crucible Co., Swissvale, Pa., succeeding **Arthur J. Jackman,** who becomes vice chairman of the board in the capacity of adviser and consultant. **Francis L. Arensberg** is board chairman.

Dr. David W. Levinson has been named assistant manager, metals research department, Armour Research Foundation, Illinois Institute of Technology. He has been a member of the foundation staff since 1952 as a specialist in physical metallurgy.

A. J. Mackan has been appointed Cleveland district sales manager, Federated Metals Div., American Smelting & Refining Co., New York. A graduate of Ohio State University, he joined the division in 1946.

Charles R. Spencer, formerly vice president-sales, Lynchburg Foundry Co., Lynchburg, Va., has been named executive vice president. Mr. Spencer joined the company in 1925.

Every Day DEPENDABILITY

Among the assets which we value most is the opinion of our foundry friends that Woodward is dependable. We believe that we merit this reputation.

We recognize how vital to the foundryman it is to have his pig iron as nearly absolutely uniform in quality as pig iron can be made. And we know, too, that foundries value a dependable source of supply—one that always puts the customer's requirements first.

Woodward makes nothing but pig iron. It seeks your business on the basis of ability to serve you well.

For quotations, write or call our

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Phone Bessemer, Ala. 5-2491

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HICKMAN, WILLIAMS & COMPANY with Sales Branches at—

609 Bona Allen Building, Atlanta 3, Ga.; 230 North Michigan Avenue, Chicago 1, Ill.; First National Building, P. O. Box 538, Cincinnati 1, Ohio; 1659 Union Commerce Building, Cleveland 14, Ohio; 1203 Ford Bldg., Detroit 26, Mich.; P. O. Box 335, Duluth 1, Minn.; 412 Guaranty Bldg., Indianapolis 4, Ind.; 70 Pine St., New York 5, N. Y.; 1500 Walnut Street Bldg., Philadelphia 2, Pa.; 1910 Clark Bldg., Pittsburgh 22, Pa.; 902 Syndicate Trust Bldg., St. Louis 1, Mo.

Woodward Iron Company

WOODWARD, ALABAMA

Independent Since 1882

DESULPHURIZATION...

LINDE's desulphurization method, for use with calcium carbide, is simple, efficient, and economical. The principal parts, shown here, are nitrogen supply, dispenser, and injection tube.

You get uniform results with Metallurgical Carbide from LINDE

In the foundry, you can produce high grade iron only by making sure you use metal with a low sulphur content. As a desulphurizing agent, metallurgical calcium carbide assures *uniformity* in the metal you produce. You know in advance that by adding a certain amount of carbide you remove a certain percentage of sulphur. Because metal specifications can be met efficiently and economically with carbide, you eliminate any need for wasteful "trial and error" methods.

Linde's method of mixing UNION calcium carbide and molten iron is simple and sure. A stream of fine mesh carbide and nitrogen under pressure is forced from a dispenser through a hose. The graphite injection tube is immersed deep in the hot metal. The carbide blends evenly and thoroughly with the iron. Desulphurization with UNION calcium carbide creates no fumes, does not attack refractories. The LINDE equipment—nitrogen supply, dispenser, and injection tube—is easy to operate and maintain.

If you would like more information about LINDE's method of desulphurization, using calcium carbide, just call or write your nearest LINDE office. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. In Canada: Linde Company, Division of Union Carbide Canada Limited.

Linde
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UNION CARBIDE

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● E. R. HUCKMAN
. . . assistant field sales mgr.

● J. J. LINCOLN JR.

● J. H. KEENEY

Air Reduction appointments

● DONALD G. TUCKER
. . . Nordberg Mfg. Co. sales

and has served as pipe salesman, assistant western sales manager in Chicago, castings division sales manager, and general sales manager.

• **E. R. Huckman** has been appointed assistant field sales manager, Foxboro Co., Foxboro, Mass. With the company since 1927, he served in the Tulsa, Okla., and St. Louis offices until 1941 when he was transferred to New York. He will continue as regional manager of the New York area, including sections of Connecticut, New Jersey, and New York. His duties as manager of the New York city branch office have been assumed by **H. R. Cushman,** formerly sales engineer there.

• **William J. Jenkins** has joined Erie Strayer Co., Erie, Pa., as northeastern representative for its bucket division, with headquarters in New York. He will cover the eastern seaboard from the Canadian border to North Carolina. Mr. Jenkins recently served as design engineer, Hayward Co., New York, and previously spent 9 years with Owen Bucket Co., Cleveland.

• **J. J. Lincoln Jr.** was recently appointed president, Pure Carbonic Co. Div., Air Reduction Co., New York, succeeding **E. R. Lawrence,** who has become chairman of the division. **J. H. Keeney** has succeeded Mr. Lincoln as Air Reduction Sales Co.'s vice president of the southern region with headquarters in Houston. **L. T. D. Berg,** formerly assistant marketing manager-equipment, has taken over Mr. Keeney's former duties as marketing manager-equipment in New York.

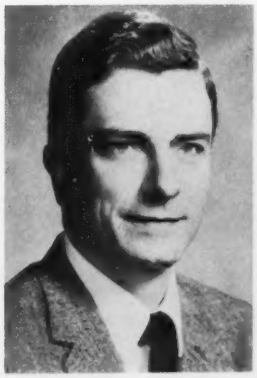
• **C. M. Capka** recently joined Despatch Oven Co., Minneapolis, as general sales manager. Mr. Capka attended Cornell University and for the last 8 years was with Eclipse Fuel Engineering Co., Rockford, Ill., as sales manager of the industrial combustion division. Previously he was sales representative, Peabody Engineering Corp., Stamford, Conn.

• **Richard J. Mills** has been named general sales manager, American Hoist & Derrick Co., St. Paul. Mr. Mills has been with the company for 12 years, and recently was eastern district regional manager.

• **Donald G. Tucker** has been appointed Midwest sales representative, Nordberg Mfg. Co., to specialize in Meehanite casting applications and special contract work. With the company since 1948, for the last two years he has been assistant to the superintendent and production manager of the steel fabrication shop in Milwaukee. Previously he was project engineer for construction of the fabrication shop and project engineer for expansion of Nordberg's St. Louis foundry.

Richard Lewis has been appointed manager-finance, Foundry Department, General Electric Co., Schenectady, N. Y. He has been with the company since 1947.

• **Henry C. Winte,** chairman of the Philadelphia Chapter of the American Foundrymen's Society, has been director of research, Florence Pipe Foundry & Machine Co., Florence, N. J., since 1952. After graduation from Michigan State College he was associated with Saginaw Malleable Iron Div., Saginaw, Mich., Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., Fairbanks,



● WILLIAM J. JENKINS
. . . joins Erie Strayer Co.

● RICHARD J. MILLS
. . . general sales mgr.

● C. M. CAPKA
. . . joins Despatch Oven

● HENRY C. WINTE
. . . AFS Chapter Chairman

can you afford the HIGH COST of uncoated shell sand?

ARE YOU PAYING MORE THAN THE COST OF COATING EQUIPMENT WITHOUT GETTING THE BENEFITS?

Weigh the cost of coating equipment against the savings it will effect in reduced resin requirements, higher production, improved quality, and storage and handling advantages. You will find the savings will quickly pay for Speedmullor coating equipment.

SPEEDMULLOR COATED SANDS CUTS RESIN COSTS UP TO 50%

SPEEDMULLOR COATED SANDS IMPROVE CASTING QUALITY

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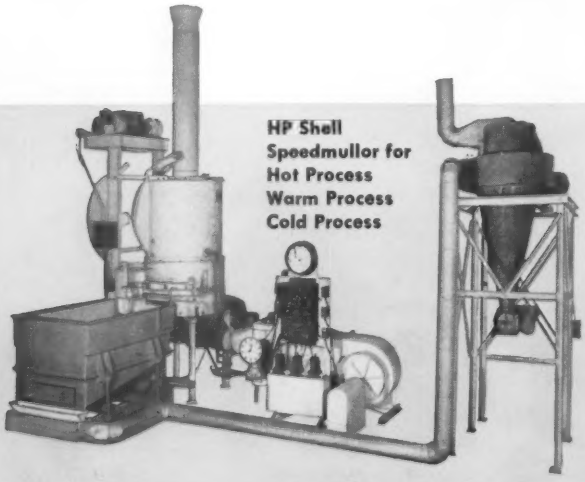
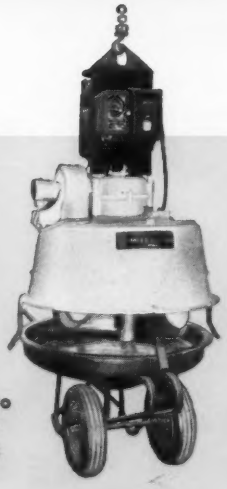


HP Shell Speedmullor for Hot Process Warm Process Cold Process



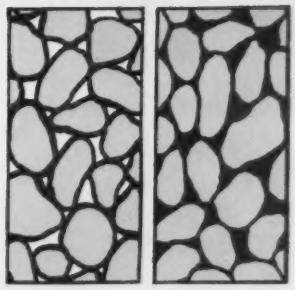
Shell Mulbaro Lowest Cost Cold Process

There is no segregation of resin with Speedmullor-coated sand . . . perfect bond is obtained with a minimum of resin. The microscopic layer surrounding the *coated* grain effects a superior bond with far less resin. CAN YOU AFFORD to use up to twice as much resin and still not obtain maximum physical properties in an *uncoated* mixture?

Speedmullor-coated sands produce stronger, more uniform shells with no gas-forming, segregated resin pockets. The resin is all in a perfect film around the sand grains. Properly *coated* sands provide excellent flowability and moldability, further enhancing quality. CAN YOU AFFORD casting losses because of arching, voids, porosity and blows or gas holes caused by resin segregation in an *uncoated* mixture?

Speedmullor-coated sands are processed for stability. The physical properties of the *coated* sand remain unchanged indefinitely under normal storage conditions. CAN YOU AFFORD costly losses when *uncoated* sands must be discarded because of deterioration in storage? CAN YOU AFFORD the poor casting quality caused when partially deteriorated *uncoated* sands are used?

Speedmullor *coating* eliminates the hazards and drawbacks of dry resin sand mixtures. CAN YOU AFFORD to risk the severe dust and explosion hazard, and air contamination because of the very fine resins used in *uncoated* sand mixtures? CAN YOU AFFORD the expense of using only part of the resin for bonding, losing the rest through the exhaust system?



Left: A microscopic film of resin surrounds each grain of sand in a Speedmullor-coated mixture, effecting a superior bond.

Right: Up to twice as much resin is required to effect a bond in a dry resin sand mixture, and maximum physical properties can't be developed.

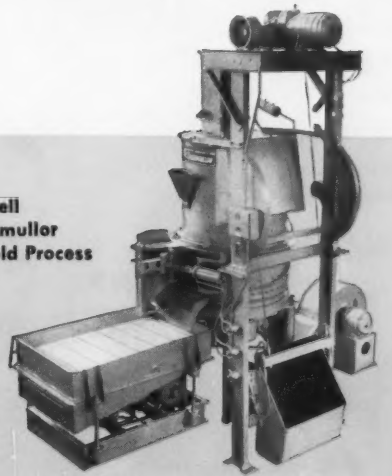
SHELL SPEEDMULLOR

FIRST FOR COATED SANDS

FIRST FOR HOT PROCESS

FIRST FOR COLD PROCESS

FIRST FOR WARM PROCESS



CP Shell Speedmullor for Cold Process

Beardsley & Piper Div. Pettibone Mulliken Corp.

2424 N. Cicero Avenue, Chicago 39, Illinois

Use the reader service card inserted in this publication to obtain additional information.

Circle 617 on Page 51

● **RICHARD M. OVESTRUD**
. . . joins Reichhold Chemicals

● **ROBERT K. WALDREN**
. . . Hyster midwest sales

● **J. P. CULLEN**
. . . bucket sales mgr.

● **GORDON C. CURRY**
. . . joins Dollin Corp.

Morse & Co., Beloit, Wis., and Worthington Corp., Buffalo. In 1950 Mr. Winte became superintendent of the Stoughton, Wis., foundry, Garden City Foundry Co., Chicago, where he remained two years. He is a past chairman of the Western New York Chapter.

● **Richard M. Ovestrud** has been appointed manager, research and development, Foundry Products Div., Reichhold Chemicals Inc., with headquarters at the Elizabeth, N. J., plant. Recently chief metallurgist, Rhuda Media Co., Marble, Minn., he was previously with Northland Aluminum Products and Minneapolis-Moline Co., Minneapolis. He is a graduate of University of Minnesota.

● **Bruce Mayo** has been appointed Birmingham district manager, Link-Belt Co., Chicago, succeeding **J. Ross Arnold,** who has been transferred to Colmar, Pa., to handle a special assignment for the company. Mr. Mayo joined the company in 1945, and since 1955 has been a sales engineer in the Louisville, Ky., district office.

● **Robert K. Waldren** was recently named midwest representative, Hyster Co., Chicago. He joined the company last year after serving as representative for M. H. Equipment Inc., Hyster dealers in Peoria, Ill., and also was manager of its St. Louis branch.

● **J. P. Cullen** has been appointed manager of clamshell bucket sales, Blaw-Knox Co., Pittsburgh, succeeding **Arnold Hooper,** retired. Since 1951 Mr. Cullen has been West Coast manager. He joined Blaw-Knox in 1938.

W. C. Musham was recently appointed president-treasurer, Imperial Brass Mfg. Co., Chicago, succeeding **F. C. Shafer,** who continues as chairman of the board.

● **N. F. Moody** has been appointed Philadelphia district manager, Air Reduction Sales Co., New York, succeeding **E. B. Walker,** who has retired after more than 33 years of service. **H. F. Colt Jr.,** formerly assistant district manager, Philadelphia, replaces Mr. Moody as Boston district manager.

● **Gordon C. Curry** has been appointed general sales manager, Dollin Corp., Irvington, N. J. For 26 years Mr. Curry was associated with Hoover Co., Canton, Ohio, where he helped to inaugurate the diecasting division, and spent 11 years with Precision Casting Co., Fayetteville, N. Y., as eastern sales manager and general manager. He is chairman of the Educational Committee, American Die Casting Institute.

Herbert J. Weber, director of the Safety, Hygiene, and Air Pollution Control Program, American Foundrymen's Society, Des Plaines, Ill., was recently appointed chairman of the committee on ferrous foundries, Air Pollution Control Association. He has also been made chairman of the committee on mechanical cutting and abrading, American Standards Association.

● **George H. Dennison** was recently named general manager in charge of sales, Keystone Abrasive Wheel Co., Carnegie, Pa. He was formerly a district sales manager, Carborundum Co., Niagara Falls, N. Y., where he spent 22 years, and was

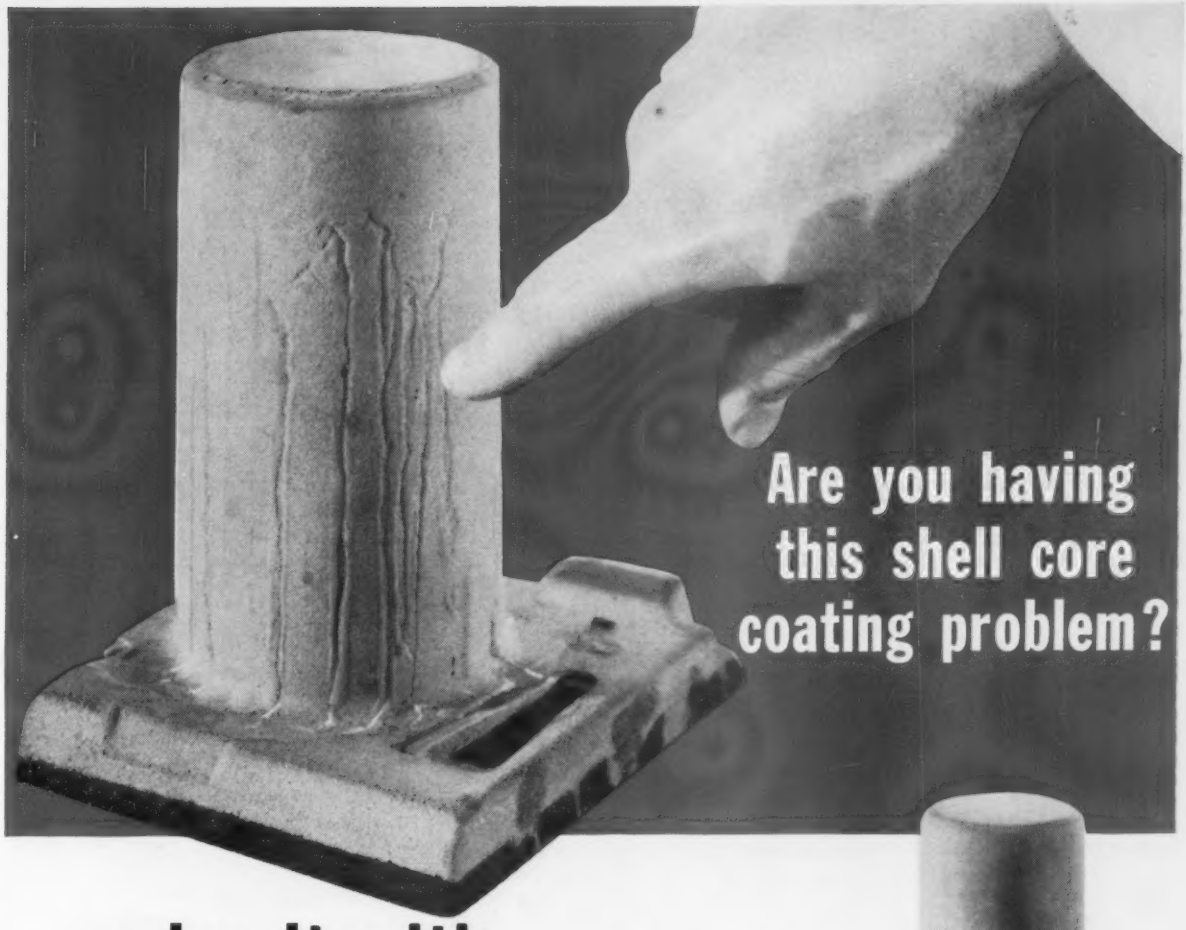
● **BRUCE MAYO**
. . . Link-Belt district mgr.

● **H. F. COLT JR.**

● **N. F. MOODY**

Air Reduction Sales appointments

● **GEORGE H. DENNISON**
. . . Keystone sales mgr.



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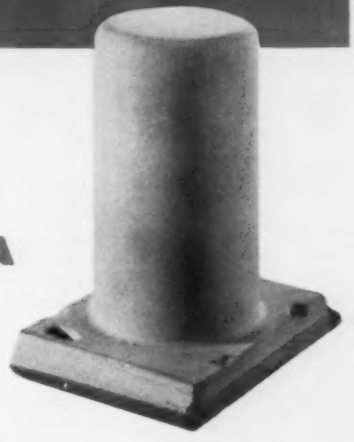
THIEM FERRO KOTE #17 FRA

THE SHELL CORE COATING WITH REMARKABLE WETTING POWERS



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- **No split film — no tear drops**
- **Smoother metal casting surfaces**
- **Reduced cleaning costs**

Let your Thiem man work with your coremaking department to eliminate shell core coating problems . . . or write DIRECT!

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THIEM PRODUCTS, INC.

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Manufacturers of foundry products exclusively

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Manufacturers Equipment & Supply Co., Chattanooga, Tenn. & Birmingham, Ala.
Walter A. Zeis, Webster Groves, Missouri
Don Barnes, Ltd., Hamilton, Ontario, Canada
Western Foundry Sand Co. Seattle, Washington
Kramer Industrial Supply, Inc. Denver, Colorado
C. Eugene Silver, Houston, Texas
Everitt H. Lueders Bala Cynwyd, Penna.
Pearson & Smith Spokane, Washington

● CLEMENT J. FREUND
. . . on leave in W. Pakistan

● HOWARD H. DEEM
. . . mfg. director

● A. V. LORCH
. . . Kaiser marketing mgr.

associated for two years with Bay State Abrasive Products Co., Westboro, Mass.

● **Clement J. Freund**, dean, College of Engineering, University of Detroit, is starting a two-years' leave of absence to act as consultant to the ministry of West Pakistan. His principal task will be to plan, organize, and put into operation in the ministry a directorate of engineering and technical education. He will be stationed in Lahore, an important university city, the second largest in West Pakistan. Contractor for the project, which is being financed by the Ford Foundation, is Oklahoma State University.

Carl M. Kaltwasser has been added to the Pittsburgh staff of field engineers, Jervis B. Webb Co., Detroit. He joined the company three years ago. **Clarence Dykstra** has been appointed sales manager for the Spanmaster Crane Division, with headquarters at company offices in Detroit. Prior to joining Jervis B. Webb Co. as a sales engineer he was with Overhead Crane & Service Corp., Detroit.

J. R. Brandon has been appointed manager of the field service department, Industrial Products Div., Hewitt-Robins Inc., Stamford, Conn. **J. H. Hayden Jr.** has been made product manager of conveyor equipment sales, Robins Conveyors Div., Passaic, N. J. Mr. Brandon joined the company in 1952 and Mr. Hayden in 1954.

Harold V. Engh Jr. has been named vice president, and **Willard F. Vanderbeek**, secretary-treasurer, Turner Brass Works, Sycamore, Ill. Mr. Engh was formerly plant manager and Mr. Vanderbeek was head of the engineering department.

● **Howard H. Deem** has been appointed director of manufacturing for Valvair Corp. and its affiliate, Sinclair-Collins Valve Co., Akron, Ohio. Mr. Deem will direct manufacturing and foundry operations in the Akron and Canton, Pa., plants. He spent eight years with Ford Motor Co., recently as supervisor of the plant and manufacturing engineering section of the Cleveland foundry.

James M. Knox was recently named executive vice president-treasurer, and **Dr. H. J. White**, secretary, Research-Cottrell Inc., Bound Brook, N. J. Mr. Knox was formerly assistant director-business manager of the Brookhaven National Laboratory. Dr. White continues as director of research and development in addition to his new duties.

Thomas Martin, Universal Foundry Co., Oshkosh, Wis., has been elected president of the Wisconsin Council of Foremen's Clubs. Mr. Martin also is president of the Universal Foremen's Club.

Vincent R. Troglione recently joined Industrial Furnace Div., Sunbeam Corp., Chicago, as general manager. Previously he was vice president, Ferguson Equipment, and chief engineer, Loftus Engineering Corp., both of Pittsburgh. Mr. Troglione is a graduate of Pennsylvania State University.

Frank R. Elliot, since 1956 assistant manager, has been appointed manager of the Attica, N. Y., plant, Westinghouse Electric Corp., succeeding **E. I. Andersen,** who has retired. Mr. Elliott joined the Cleveland plant as a metallurgist in 1924 after graduation from Northeastern University. He held various supervisory positions at East Pittsburgh, Pa., and East Springfield, Mass.

● **A. V. Lorch** has been named marketing manager, pig and ingot, Kaiser Aluminum & Chemical Sales Inc., Oakland, Calif. Succeeding Mr. Lorch in Chicago as pig and ingot product manager is **W. J. Lawler. D. R. Tietjen** has been named his assistant. Prior to joining Kaiser Aluminum in 1951 Mr. Lorch was with Bendix Aviation Corp., Teterboro, N. J., and White Metal Rolling & Stamping Corp., Brooklyn, N. Y. Mr. Lawler has been operating superintendent at the company's Trentwood, Wash., plant. Mr. Tietjen has been salesman in New York and branch manager in Syracuse, N. Y.

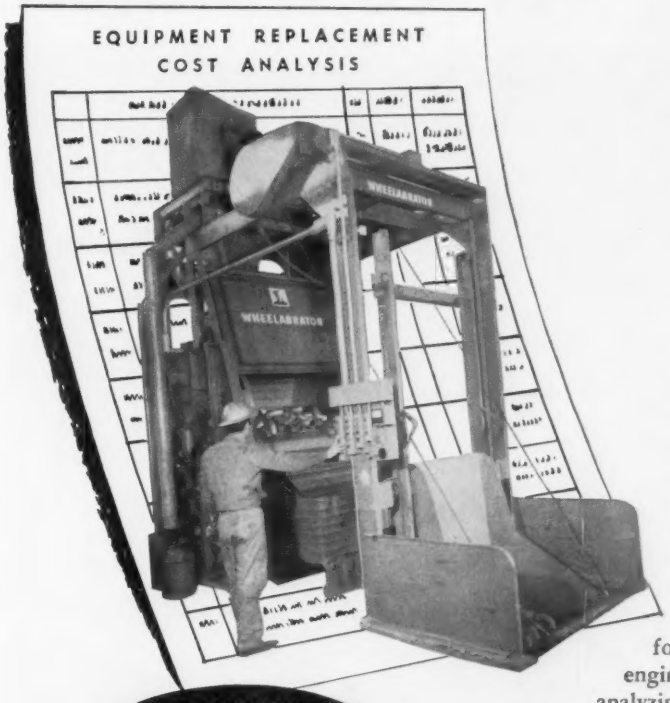
L. S. Hilton was recently appointed sales manager, abrasive and diamond wheel departments, Manhattan Rubber Div., Raybestos-Manhattan Inc., Passaic, N. J. Formerly assistant sales manager, he succeeds **W. H. Steinberg,** who was named technical consultant.

James R. Greaves has joined Joseph Dixon Crucible Co., Jersey City, N. J., as sales representative with headquarters in Los Angeles. Previously he was foundry superintendent, Precision Castings Co., in California.

Lewis J. Willner has been named manager of the Chicago area, Luria Bros. & Co., Philadelphia. He has been with the company for 19 years. **F. W. Toohey** has been transferred to the New York office as special assistant to the president.

Oliver E. Shipp recently joined Sam Tour & Co., and the American Standards Testing Bureau Inc., New York. He has spent 16 years in metallurgical fields including melting, casting, forging, heat treating, cold working of metals, etc.

Are You Paying for Blast Equipment *You Don't Have?*



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SAVINGS $11,000.00

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Cost Analysis Forecasts Savings in Cleaning Costs

It may be that your blast equipment is giving you virtually the same performance it provided when it was brand new. But the cost of operating older machines, when newer, more efficient equipment is available, usually far exceeds the cost of purchasing and operating the more modern equipment.

A realistic cost evaluation of your cleaning operations may reveal that you, too, are paying for equipment you don't have. Wheelabrator engineers, using the most modern methods for analyzing the cost of equipment replacement, will assist you in making such a study. Similar replacement studies have revealed savings in one case of $16,695 a year by replacing two blast machines with a Super Tumblast. In another study, annual savings of $13,221 were shown.

Call in a Wheelabrator engineer today. Let him prove to you that Wheelabrator airless blast equipment will pay for itself through savings in operating costs, increased cleaning capacity, reduced manpower, and greatly reduced maintenance.

OPERATING COSTS AND CLEANING TIME SLASHED 50%

Both labor and operating costs were cut in half at the Wahkonsa Foundry Company with the installation of a Wheelabrator Super Tumblast for cleaning cast iron soil pipe fittings. Loads are cleaned in 5 minutes.

SAVES 22 MAN-HOURS DAILY

At Canton Malleable Iron Company two standard blast mills were operated two full shifts daily, requiring 32 man-hours of operator time. A Super Tumblast now does the same volume of work in only 10 man-hours. Castings formerly requiring 30 to 45 minutes are now cleaned in 9 minutes.

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FRANK X. BUJOLD
Elected FEF President

FRANK G. STEINEBACH
New FEF Vice President

FEF CONFERENCE

Stresses Need for Foundry Science and Engineering

INCREASING dependence of the foundry industry on effective use of scientific and engineering knowledge was emphasized at the 11th annual College-Industry Conference of the Foundry Educational Foundation.

This annual meeting for the exchange of views between foundrymen and faculty members of engineering schools was held at Hotel Statler, Cleveland, March 12-13. FEF President Chester V. Nass, vice president, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, presided.

Highlight of the program was the announcement that the Wheelabrator Foundation has made a $100,000 grant to FEF to be devoted largely to graduate fellowships (see Page 142 for details of the program). Although FEF activities have been confined to the undergraduate level of university training, it was pointed out by several speakers that the need for graduate study opportunities to help broaden advanced knowledge has become increasingly apparent. These opportunities now will be provided.

Officers and Trustees — At the election of officers, Frank X. Bujold, general manager, Foundry Div., Ford Motor Co., Dearborn, Mich., was chosen president of FEF to succeed Mr. Nass. Frank G. Steinebach, editor, FOUNDRY, was elected vice president. E. M. Knapp, president, Ferro Machine & Foundry Inc., Cleveland, was re-elected treasurer, and Warner B. Bishop, vice president, Archer-Daniels-Midland Co., Cleveland, was named secretary.

Newly elected trustees-at-large are J. F. Connaughton, president, Wheelabrator Corp., Mishawaka, Ind.; A. L. Gostow, general manager, Forge & Foundry Div., Chrysler Corp., Detroit; C. Fred Strom, research director, Griffin Wheel Co., Chicago; David H. Morgan, director of college relations, Dow Chemical Co., Midland, Mich.; Guy F. Baker, vice president, Duriron Co., Dayton, Ohio.

New trustees appointed by founding member societies of FEF are the following: American Foundrymen's Society—William D. Dunn, assistant to the president, Oberdorfer Foundries, Syracuse, N. Y.; Steel Founders' Society of America—James J. Ewens, vice president, Grede Foundries Inc., Milwaukee; Gray Iron Founders' Society—Paul W. Olson, general manager, Eaton Mfg. Co., Foundry Div., Vassar, Mich.; Malleable Founders' Society—E. O. Jones, personnel director, Belle City Malleable Iron Co., Racine Wis.

Non-Ferrous Founders' Society—Robert Langsenkamp, secretary, Langsenkamp-Wheeler Brass Works Inc., Indianapolis—Foundry Equipment Manufacturers Association—Einar A. Borch, vice president, National Metal Abrasive Co., Cleveland, and D. E. Davidson, vice president, Link-Belt Co., Chicago, to fill an unexpired term.

More Students—President Nass reported that a total of 6036 students at FEF schools are enrolled in foundry courses or courses in which foundry subjects represent a significant part. This is an increase of 1264 since a year ago. Of this group, 420 have registered so far with the foundation; these are stu-

Present and past officers and trustees at annual FEF Alumni banquet

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30% LESS CORE-MAKING TIME

50% LESS CORE-UP TIME

40% LESS CLEANING TIME

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Core: Bed-in sand and driers are not needed. The cores retain excellent dimensional accuracy.

Core Setting: Conventional methods require one core setting for fitting, as well as a re-setting. Only a single setting is needed with Kold-Set.

A good deal of core rubbing has been eliminated and there is no bed-in sand to remove. This results in a better core surface while lessening the chance of loose bed-in sand causing dirt in the casting.

Casting and Cleaning: Casting surfaces are smoother due to eliminaton of bed-in sand. Hydro-blast time has been reduced by 50%, and there is less finish chipping. Due to superior venting in the Kold-Set sand mix and less gas potential in the cores after baking, blows in the cope of the casting have been eliminated.

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THE ORIGINAL COLD-SETTING BINDER

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ORIGINAL AND EXCLUSIVE MANUFACTURERS OF THE KOLD-SET PROCESS IN THE UNITED STATES

Circle 620 on Page 51

Speaker's table at luncheon session during FEF conference. Left to right, top row: W. B. Bishop, FEF secretary; J. F. Connaughton, Wheelabrator Corp., president; F. G. Steinebach, FEF vice president. Bottom row: Dean C. J. Freund, speaker; C. V. Nass, retiring FEF president; F. X. Bujold, FEF president

dents indicating an active interest in the foundry industry.

During the past year the number of professors engaged in the foundry program increased from 41 to 44, the number of instructors from 23 to 24 and craft instructors from 9 to 12.

Total number of foundry courses available at the schools increased, but the number of departments requiring foundry study declined from 61 to 56. At the same time, the departments electing foundry study rose from 105 to 115.

Last year the schools made additions to their foundry laboratories costing nearly $70,000, or more than the amount disbursed to them by FEF for scholarships and other purposes.

Curricula and Facilities—A committee report intended to define the purpose of cast metals courses in the metallurgical, mechanical, and industrial curricula at FEF schools was presented by a panel of which W. B. Bishop, Archer-Daniels-Midland Co., was moderator. Panelists included C. W. Briggs, Steel Founders' Society of America; J. H. Lansing, Malleable Founders' Society; H. F. Scobie, Non-Ferrous Founders' Society, and C. F. Walton, Gray Iron Founders' Society.

Among the panel's conclusions is the belief that foundry courses must be based on a study of fundamentals. that ideal foundry training should emphasize basic metallurgy, and that it must include adequate cast metals laboratory experience.

The committee believes that the ideal university foundry laboratory should be of two types—one to demonstrate foundry technology and principles, the second of a more elaborate type for doing research of a postgraduate nature which also could provide income to the school.

Technical Institutes — For some time a committee has been studying the desirability of co-operation with technical institutes for the training of foundry technicians. The committee's report outlined recommendations for such an affiliation. The proposed program, while not involving scholarships, would provide considerable advisory help to the institutes.

University Developments — Key professors in the foundry programs at eight FEF schools reported on various activities of their departments and foundry students.

E. Paul DeGarmo, University of California, described a contest and displays conducted to emphasize the importance of castings and the foundry industry. Douglas C. Williams, Ohio State University, outlined some of the investigational work under way at that school and future studies being planned. C. T. Marek, Purdue University, explained how five-man teams in a metal processing course select a specific project and conduct its study. J. L. Leach, University of Illinois, discussed the foundry course requirements there.

M. S. Burton, Cornell University, said that its metallurgical engineering department, including foundry facilities, expects to occupy new quarters within two or three years. R. A. Flinn, University of Michigan, stated that stress is being placed on basic engineering fundamentals which are taught best in foundry laboratories.

M. C. Flemings Jr., Massachusetts Institute of Technology, said that a university's main goal should be to get students to want to learn rather than to teach them much specific information.

D. S. Eppelsheimer, Missouri School of Mines, reported that a nuclear engineering course is to be started at MSM in which foundry work will play an important part in casting uranium and titanium. Robert Wolf of the same school said that one of the aims of foundry courses is to make better castings customers of engineering students by teaching them foundry fundamentals and good casting design.

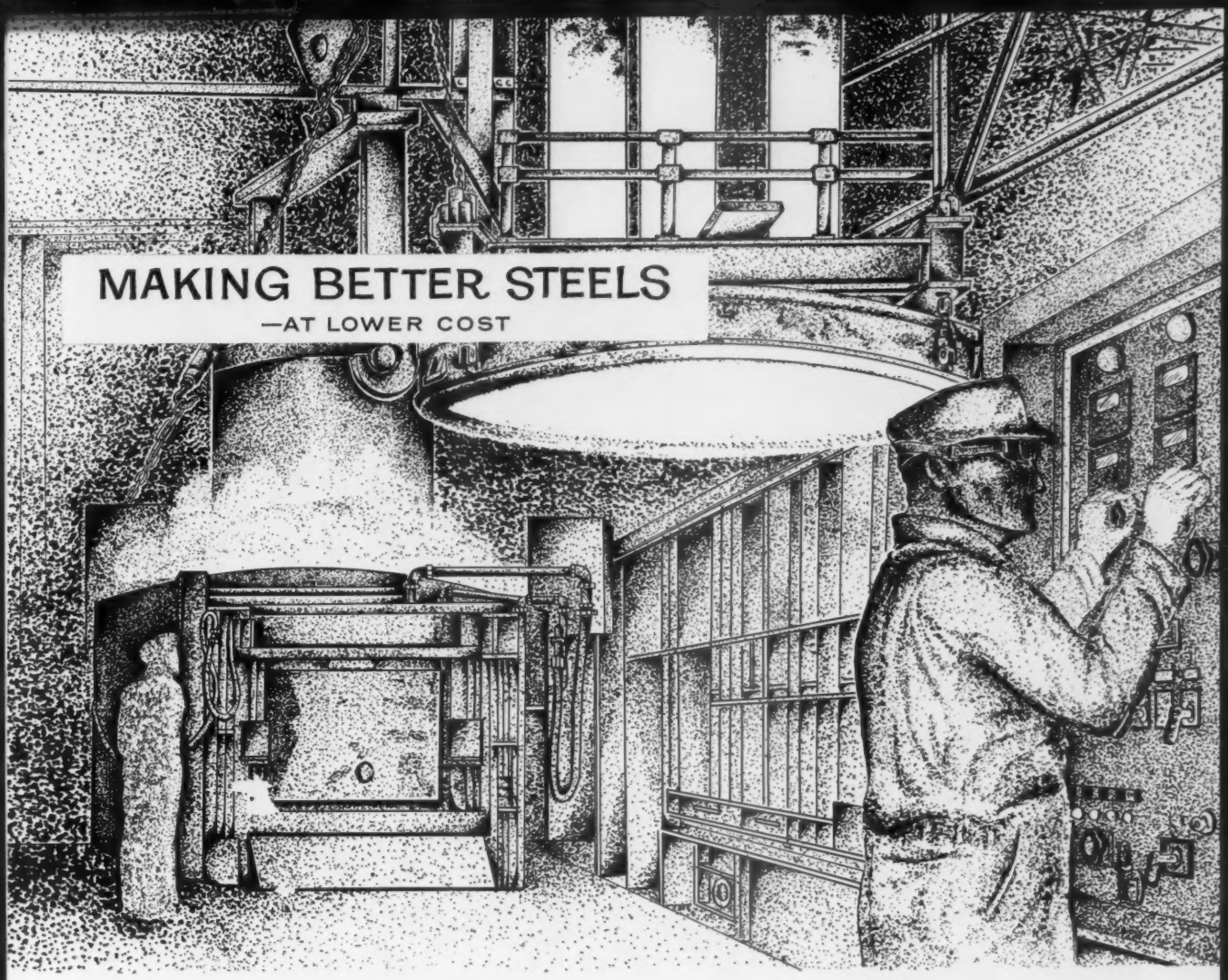
Ralph E. Betterley, education and training director of the American Foundrymen's Society, described its new Training and Research Institute's operation.

Foundry Industry Needs—A panel discussion on "An Expanded FEF To Meet the Needs of the Foundry Industry" had Frank G. Steinebach, FOUNDRY, as moderator.

In suggesting avenues for FEF expansion, Marion J. Allen, American Steel Foundries, Chicago, said that probably the next school to be added to the program would be in the Texas-Louisiana area. Such addition, however, awaits availability of funds. He suggested that fund allocations to any school be adjusted according to its FEF student registration. He also recommended the foundation consider a broader promotional policy.

Thomas T. Lloyd, Albion Malleable Iron Co., Albion, Mich., speaking on the technical institute program, said that statistics indicate need for a technician-engineer ratio of 5 to 1. Today, however, only one technician is being trained for every three engineers. Mr. Lloyd believes that technical institute enrollment will increase because of population growth, the institute's more clearly defined position and stature in the educational system, and the probability that technicians will, enjoy professional standing.

Discussing graduate study, Walter E. Sicha, Aluminum Co. of America, Cleveland, pointed out that an engineer with a bachelor degree needs more experience and a



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Circle 621 on Page 51

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fuller understanding of his chosen field to supplement his school training. Graduate work supplies the specialization that gives him earlier usefulness to his employer, particularly in the more complicated foundry procedures and techniques. It is difficult, however, to get financial help for graduate work in the foundry field; probably only ten men in the country have had such help.

George K. Dreher, Steel Founders' Society of America, Cleveland, speaking on design engineering, urged development of a program leading to establishment of casting design courses in schools. Strain gage and brittle lacquer techniques for developing design should be explained more widely. Conferences or seminars on this subject should deal with materials, structural engineering, and machine design, and would clear up many false ideas about the value of cast parts.

Research and Merchandising — Increased participation in research and merchandising is the foundry industry's most pressing need today, Dean Clement J. Freund, University of Detroit, told the conference at a luncheon session. Because of the nature of the casting process, the foundry industry more than any other field should be concerned with all that can be learned about heat transfer, fluid physics, elasticity and plasticity of materials, heat, thermodynamics, and solid state physics, he declared.

Dean Freund believes that foundrymen have been so busy attempting to improve their operating techniques that they have not given sufficient thought to merchandising.

Technology a Spur—Speaking at the annual banquet, Dr. Clyde E. Williams predicted that the foundry industry would benefit considerably from today's new technological age. Dr. Williams, president of Clyde E. Williams & Co., Columbus, Ohio, and former president of Battelle Memorial Institute, pointed out that in addition to effects of technology, population growth and rising living standards also will mean greater casting consumption.

Atomic energy, he said, will be an important factor in stimulating the industrial economy, and will result in a substantial amount of indirect business for foundries. A similar effect will be provided by developments in missiles, supersonic flight, and rocketry. Automation could be one of the biggest market potentials if predictions prove correct that a virtual replacement of the entire capital plant of America will occur within the next 20 years.

Uni-Wash Shake-Out Booth with 10,000 cfm capacity. Uses a minimum of floor space, draws in dust and hot air blasts, and deposits dust in sludge tank. Built-in fan is only moving part in air-washing process.

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The Uni-Wash Shake-Out Booth is a self-contained dust-collection unit, complete with intake hood, patented Uni-Wash air-cleansing process, and exhaust fan.

Available in five standard sizes—5,000, 7,500, 10,000, 12,500, and 15,000 cfm—they are designed to collect dust from shake-out, core knock-out, shaker-screening, sand-transfer, mold-conveyor, and pouring operations. The dust is collected in the form of wet sludge, and removed by an automatic conveyor.

Delivered to you completely preassembled, the Uni-Wash Shake-Out Booth requires only simple connections to water, electricity, and discharge duct.

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Chill Nails and Spiders
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Write for samples and prices
Choose any style from Jumbo to Stubby; slim, medium or horse nail blade; blunt, pointed, straight or 90° bent. There's a type and size Koolhead Chill Nail or Spider Chill to do your specific chill job best.
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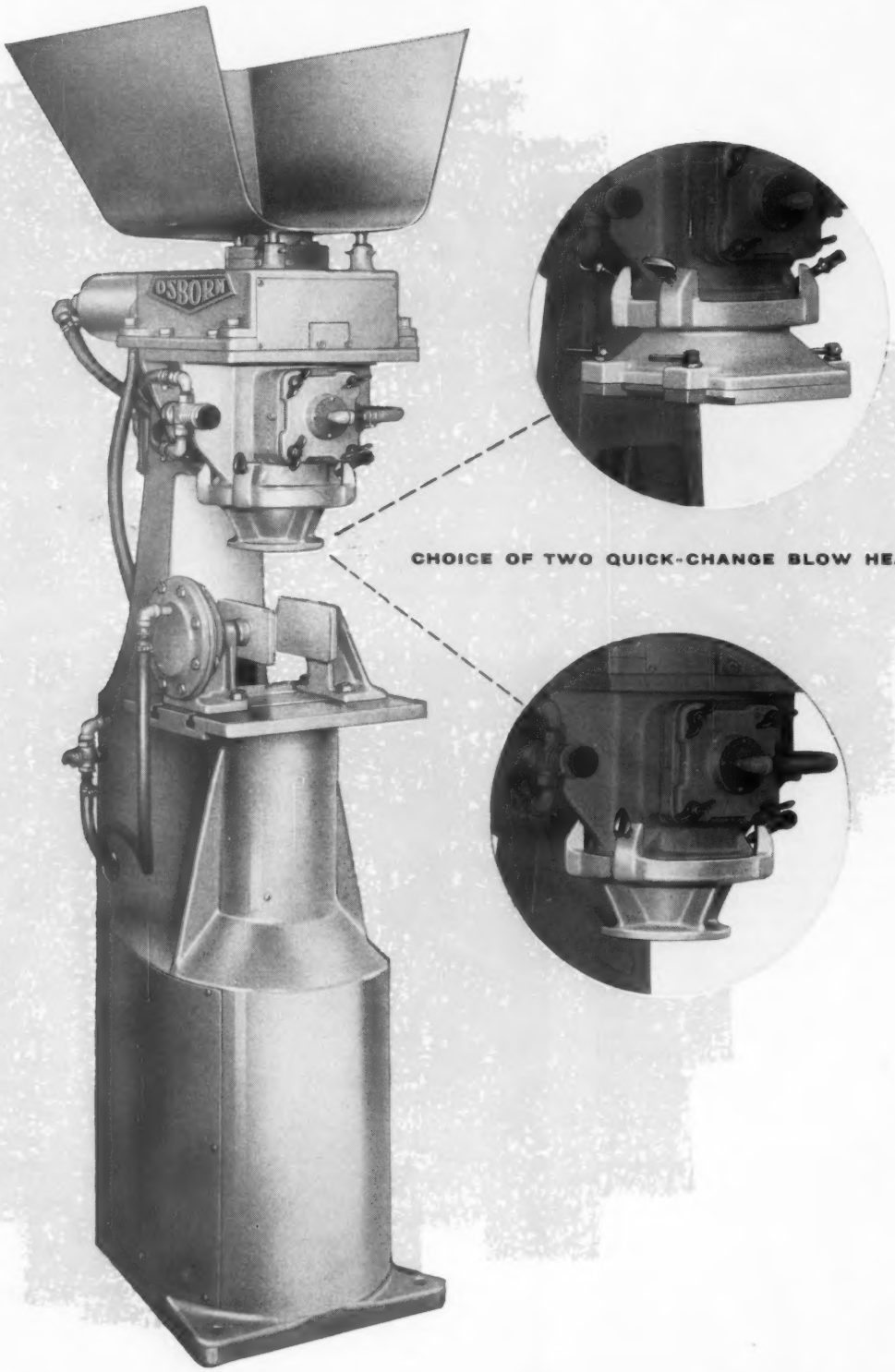

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MOLDING MACHINES • CORE BLOWERS • SHELL MOLDING MACHINES • BRUSHING MACHINES • INDUSTRIAL BRUSHES

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Circle 625 on Page 51

JET-CORE

SAND TO FINISHED CORE AUTOMATICALLY

AUTOMATIC CORE BLOWER

for low-cost, high production of quality small cores

Newest equipment development in Osborn's famous line of foundry production machinery is the No. 906 JET-CORE Automatic Core Blower.

Designed for use in production, semi-production or jobbing foundries, the JET-CORE produces quality cores at extremely low cost . . . automatically . . . at high production rates.

Write us for full details on the new JET-CORE and how it can help you trim costs and boost foundry profits. *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

OSBORN JET-CORE FEATURES

- Automatic, single push-button operation.
- High-speed machine cycle time — 2 seconds.
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- Core-Blower table adjusts and locks hydraulically.
- Unit is exceptionally compact.
- Designed to deliver highest quality cores faster . . . at low cost.

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Wheelabrator's $100,000 Grant to FEF

Will Promote Graduate Study

OTTO A. PFAFF

JAMES F. CONNAUGHTON

Ten-year program provides for 50 graduate fellowships worth $1500 each. The remainder is to be used by the Foundry Educational Foundation for fellowships, scholarships or other educational purposes

AN EDUCATIONAL grant of $100,000 has been made to the Foundry Educational Foundation by the Wheelabrator Foundation. This latter foundation was established in 1953 by the Wheelabrator Corp., Mishawaka, Ind., to provide a planned, continuing program of support for educational, religious, and charitable causes.

Announcement of the foundry educational program was made by James F. Connaughton, Wheelabrator Corp. president, at the recent FEF College-Industry Conference in Cleveland.

Ten-Year Program—Major provision of the grant is for 50 fellowships of $1500 each to be distributed during the next 10 years. The remaining $25,000 will be used by the FEF for fellowships, scholarships, or other educational purposes.

Fellowship applicants will be encouraged to take graduate study in engineering, science, or business administration at one of the 17 FEF schools. Applications in other fields and at other schools will be considered, however, if the applicant can show conclusive evidence that the graduate study requested has an immediate connection with the foundry industry and that the pursuit of the study is likely to benefit the cast metals industry to a significant degree.

Board To Make Awards—Fellowship recipients will be selected by a special board of awards appointed annually by the current FEF president. The board will consist of the president, the FEF vice president, one trustee of the FEF, and two technical directors selected from the six founding member societies on a rotating basis.

Applicants must be not more than 28 years of age on the date of application. Eligible persons will include:

1. Senior undergraduate students and present graduate students who are or have been registered with the Foundry Educational Foundation.

2. Men in and returning from the military service who were FEF registrants in college or who were employed in the foundry industry prior to entering the service.

3. Men employed in the foundry and allied industries.

Applications for graduate fellowship awards may be obtained from FEF headquarters—Terminal Tower Bldg., Cleveland 13—from key professors at FEF schools, and from key contacts at schools affiliated with the FEF but not participating in the regular FEF program.

Applicants from the foundry industry will forward applications through their employers for recommendations and further transmittal to the FEF.

First Awards This Year—With the exception of 1958, awards will be made not later than Feb. 1 of each year. Recipients will have until Sept. 15 to obtain admission approval at the selected institution for graduate study. Awards for 1958 will be made by July 1.

The fellowship program is scheduled to terminate Dec. 31, 1967. It has been given this relatively lengthy tenure to permit selection of outstanding recipients. No minimum or maximum number of fellowships to be awarded in any one year has been specified.

Commenting on the program, Otto A. Pfaff, Wheelabrator Corp. president for 17 years and now chairman of its board, pointed out, "For more than 25 of the 50 years our company has been in existence, it was known as the American Foundry Equipment Co. As such, our primary market was the foundry industry. With the growth of the foundry field, we too grew and prospered. We believe our 50th anniversary is a fitting time to express our thanks to this industry in a manner that will help it to continue to grow and prosper.

"Since starting work on this program nearly a year ago, we have seen world developments confirm our belief that advanced engineering and science must be encouraged on every possible front. This view-

At Campbell, Wyant and Cannon—

Quality Control of camshafts starts with

HANNA PIG IRON

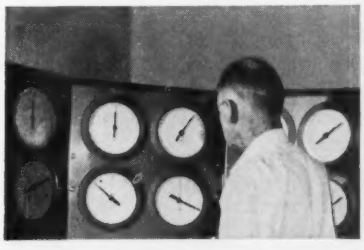
Campbell, Wyant and Cannon Foundry Company, division of Textron, Inc., has long been one of the world's leading suppliers of automotive castings. And throughout their many years of pioneering in metallurgy and foundry practice, Campbell, Wyant and Cannon has been a regular user of Hanna pig iron—both standard and silvery.

Typical of C.W.C.'s precision production in volume at their Muskegon, Michigan, foundry are cast camshafts, which were first introduced by C.W.C. to the automotive industry 25 years ago and are now used throughout the world.

Customers' specifications for these camshafts are extremely precise. Dimension, composition, including chemistry and metallurgical structure, hardness—all are vitally important.

In one of the many testing procedures employed to assure that casting quality is up to specifications, C.W.C. through the use of a direct reading spectrometer determines approximately every 20 minutes the analysis of samples taken from electric furnaces and ladles. The commercial application of spectrographic analysis of metals in the foundry was first worked out by C.W.C. in conjunction with the University of Michigan. Only metal made with pig iron of accurate analysis and superior uniformity, like Hanna pig iron, can pass this exacting quality control check.

Hanna produces all regular grades of pig iron as well as HannaTite and Hanna Silvery. All grades are available in the 38-lb. pig and the smaller HannaTen 12½-lb. ingot. Your Hanna representative will be pleased to tell you more about the advantages of using Hanna pig iron.



At 20-minute intervals, C.W.C. checks metal analyses with a direct reading spectrometer.

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A few of the 50 million camshafts produced by Campbell, Wyant and Cannon Foundry Company.

NORTHWEST OLIVINE
FOR QUALITY SHELL MOLDING

These are the properties of Northwest Olivine that enable you to produce smoother, more accurate shell mold castings at greater profit!

- EXCELLENT THERMAL CONDUCTIVITY
- LOW UNIFORM THERMAL EXPANSION
- HIGH HEAT CAPACITY
- SELECTION OF GRAIN SIZES
- BENEFICIAL ANGULAR GRAIN

THERMAL CONDUCTIVITY. The high thermal conductivity of Olivine Sand at temperatures below 1000°F. causes rapid formation of the casting skin at the metal-mold interface. This will result in better surface smoothness for nonferrous castings and vastly improved surfaces on carbon steel and iron castings.

GRAIN SIZES. Northwest Olivine Sands are manufactured products that can be controlled and reproduced. Several selected grain sizes are available, and can be used alone or in combination to arrive at the most suitable aggregate for your operation.

THERMAL EXPANSION. When metal is poured into a shell mold, the expansion of the shell at the pattern cavity causes that part of the shell to buckle outward. The forces set up by this action can crack the strongest shell. The use of Olivine as a low expansion aggregate will produce more accurate castings, and will permit larger castings to be poured without backing material.

HEAT CAPACITY. A material with high heat capacity will absorb more heat from the casting to raise the temperature of the mold. In effect this will set back or delay temperature rise in the shell, shell distortion and gas formation.

ANGULAR GRAIN. When a dry mix is employed in a dump box, the angular shape of Olivine aggregate is helpful in reducing grain segregation and "dusting out" of the resin binder. Mixtures of angular grain Olivine and round grain silica have been used successfully by commercial shell molders without noticeable segregation.

NORTHWEST OLIVINE IS CONSISTENTLY SHOWING ITS VERSATILITY AS A SHELL MOLDING MATERIAL. ACTUAL ON THE JOB EVALUATIONS SHOW IMPROVED QUALITY AND LOWER COST ON SUCH VARIED APPLICATIONS AS IRON, MANGANESE STEEL, CARBON STEEL, BRASS, BRONZE AND ALUMINUM ALLOYS.

TWIN SISTERS OLIVINE has proven a dependable and economic production material in foundries throughout the nation. TWIN SISTERS BRAND SANDS are manufactured aggregates produced from the highest quality, most refractory, solid rock Olivine deposit presently known in the western hemisphere: The western Cascade Mountain area of Washington State. Processing of TWIN SISTERS BRAND Olivine Sands is carefully and uniformly controlled. Currently being produced in 4 grades or sizes approximating AFS numbers 40, 70, 130, and the minus 200 mesh CASCADE BRAND Flour.

Available in carload quantities—In bulk or sack. (100 lb. paper bags) Mixed carloads of various grades (packaged) to your order!

TWIN SISTERS BRAND — Olivine Foundry Sand
CASCADE BRAND — Olivine Flour

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point is also supported by the fact that many engineering schools, including several FEF universities, are de-emphasizing 'vocational' courses for their junior and senior students and putting more emphasis on advanced physics, mathematics, and similar courses designed to prepare engineers to cope with advanced science and technology. An outgrowth of this change in approach has been increased interest in graduate study."

Mr. Connaughton observed that "foundry science is important and has long been neglected at the graduate level. America needs advanced scientists, engineers, and leaders in every field. Wheelabrator has chosen to place its efforts in the foundry field; we hope that companies and organizations in every field will lend their support where they feel they can do the most good."

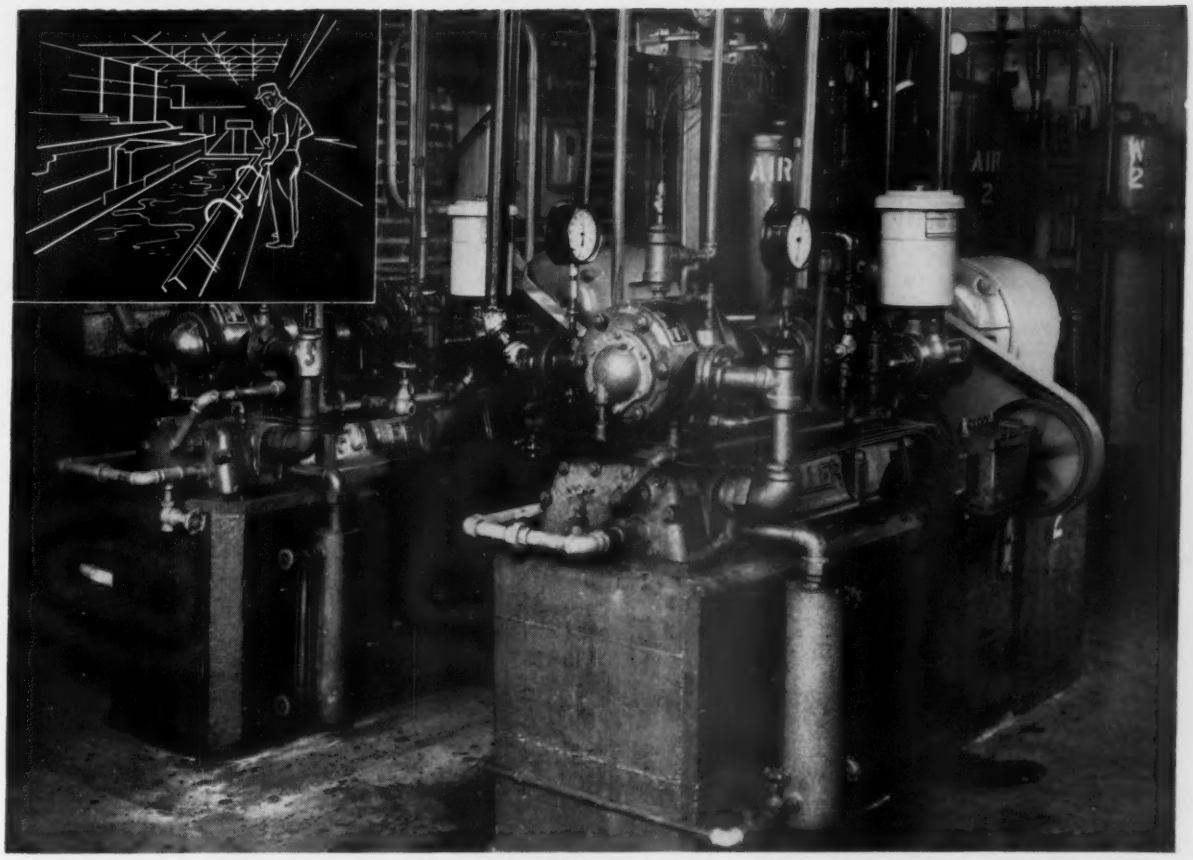
First Half-Century — Wheelabrator Corp. is marking its 50th anniversary this year. Its origin dates back to 1908 when Verne E. Minich, now honorary board chairman of the company, obtained exclusive sales rights to a machine for processing foundry molding sand. Known originally as the Sand Mixing Machine Co., it merged in 1920 with the Rich Foundry Equipment Co., Chicago, to form the American Foundry Equipment Co., with manufacturing plant in Chicago and general offices in New York. The same year the Buch Foundry Equipment Co., York, Pa., maker of flasks and other foundry supplies, was purchased.

Offices and factories were consolidated in 1926 and moved to the company's present site at Mishawaka, Ind. Invention in 1933 of the centrifugal blasting wheel type unit for cleaning of castings led to the company's changing its name in 1946 to American Wheelabrator & Equipment Corp. In 1955 this was shortened to Wheelabrator.

Annual Management Course To Be Held June 16-28

Annual management course of the College of Engineering, State University of Iowa, will be held June 16-18. It is designed for factory managers, foremen, industrial engineers, methods and time-study analysts, cost men, office executives, and others in related work. Recognized authorities will present it.

Information about the course can be obtained from J. Wayne Deegan, 122 Engineering Bldg., State University of Iowa, Iowa City, Iowa.



These two-stage Fuller Rotary Compressors are direct electric motor driven through flexible couplings to provide compressed air for a large eastern steel company.

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helps keep steel plant operating around the clock!

Compressed air is so vital in the alloy tube division of this large eastern steel company, that the plant would have to shut down without it!

The chief maintenance engineer of the company writes: "The first Fuller Rotary Compressor was purchased on the basis of experience by other users and cost comparison with other compressors.

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Fuller rotary compressors can be installed in limited quarters and on ordinary flooring. They give long life and smooth operations. The elimination of valves, crankshafts, pistons and other moving parts greatly reduces the need for attention, adjustment and replacement. Blades are held out by centrifugal force, automatically compensating for wear, thus maintaining new machine efficiency and capacity. The rotary principle permits a design completely free of reciprocating parts, avoiding the basic cause of pulsation.

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Industry Briefs

GENERAL Electric Co. will install a $3,700,000 steel foundry in its present iron foundry building at Schenectady, N. Y. It will increase steel castings production there by 50 per cent. Completion is expected in 1960. New equipment will include an electric arc furnace equipped with an induction stirring device and capable of melting over 100 tons of steel or high-grade iron. A 125-ton bridge crane, two high-temperature heat treating furnaces, a new water blast cleaning room, and an expanded shotblast room also will be added.

Bakelite Co., a division of Union Carbide Corp., New York, has appointed Cadillac Plastic & Chemical Co., 15111 Second, Detroit 3, Mich., to be national distributor for the company's epoxy resins and hardeners.

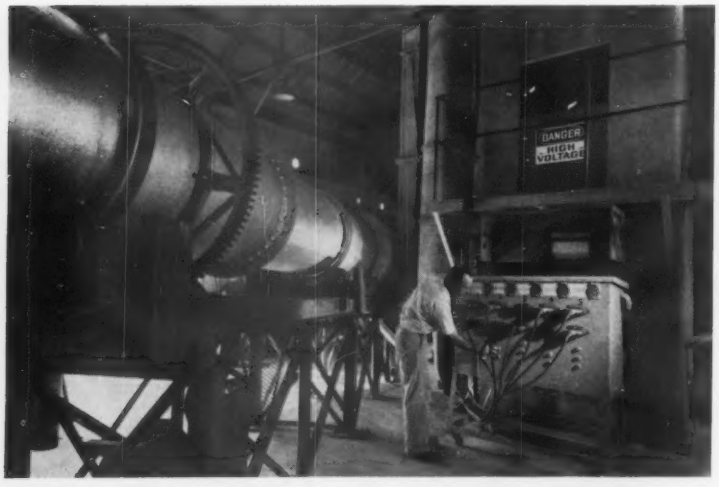
Electro Refractories & Abrasives Corp., Buffalo, has been granted a patent for an improved alumina lining that is said to improve bonding and glaze adherence and extend the life of carbon-bonded, silicon-carbide crucibles.

Lithium Corp. of America Inc., Minneapolis, and **Brooks & Perkins Inc.**, Detroit, have formed a working agreement to conduct joint research on alloys containing lithium and other metals.

B P Research & Manufacturers Inc., 104 Fuller St., Schenectady, N. Y., has been granted a charter of incorporation as a foundry and machine shop with capital stock of 200 shares of no par value. Directors are Carmen Palmer, 21 Puritan Dr.; June Rose, 254 S. Ferry St.; and Louis Lombardi, 809 Mason St., all of Schenectady.

Ajax Electric Co., Trenton, N. J., has licensed Italforni of Milan, Italy, to produce units incorporating Ajax basic designs and principles for sale in Italy.

Yale Materials Handling Div., Yale & Towne Mfg. Co., Philadelphia, has established a factory branch for the sale and service of lift trucks at 6055 Fairmount Extension, San Diego, Calif. It is under the direction of James B. Cunningham.



MINERALOGICAL RESEARCH: Pilot plant operations check theoretical findings at the new mineralogical laboratory established by International Minerals & Chemical Corp., Chicago, at its research experiment station near Mulberry, Fla. Rotary kiln, left, and electrostatic tower, in background, are controlled from the single panel shown, along with various other equipment in the same building. The Mulberry station employs 74 scientists and technicians and handles about 50 per cent of the company's total research program, including foundry product development

National Research Corp., Cambridge, Mass., has been awarded a $460,000 government contract for the design and construction of a 500-lb capacity, vacuum skull furnace to be used in the melting of titanium.

Industrial Heating Equipment Association Inc., Washington, reports that total billings of furnace manufacturers in 1957 were $131,827,000, or 6 per cent more than the $123,922,000 billed during 1956. Billings for January, 1958, were $3,045,000, 59 per cent under the $7,380,000 recorded for the same month in 1957.

J. O. Ross Engineering Div., Midland-Ross Corp., New York, has completed plans for construction of a new Chicago office building in suburban Mt. Prospect, Ill. It will house engineering and office personnel servicing the midwest area.

Budd Co., Philadelphia, has purchased Krouse Testing Machine Co., Columbus, Ohio. The new subsidiary will continue under its previous management, with Glen Krouse, founder, as president of the company.

Applied Research Laboratories, Glendale, Calif., has opened an expanded demonstration laboratory maintaining a full line of spectrochemical instruments at 20200 W. Outer Drive, Dearborn, Mich.

Eastern Foundry Co., Boyertown, Pa., has added 20,000 sq ft of foundry space. The new building fronts the old main foundry and will more than double casting production.

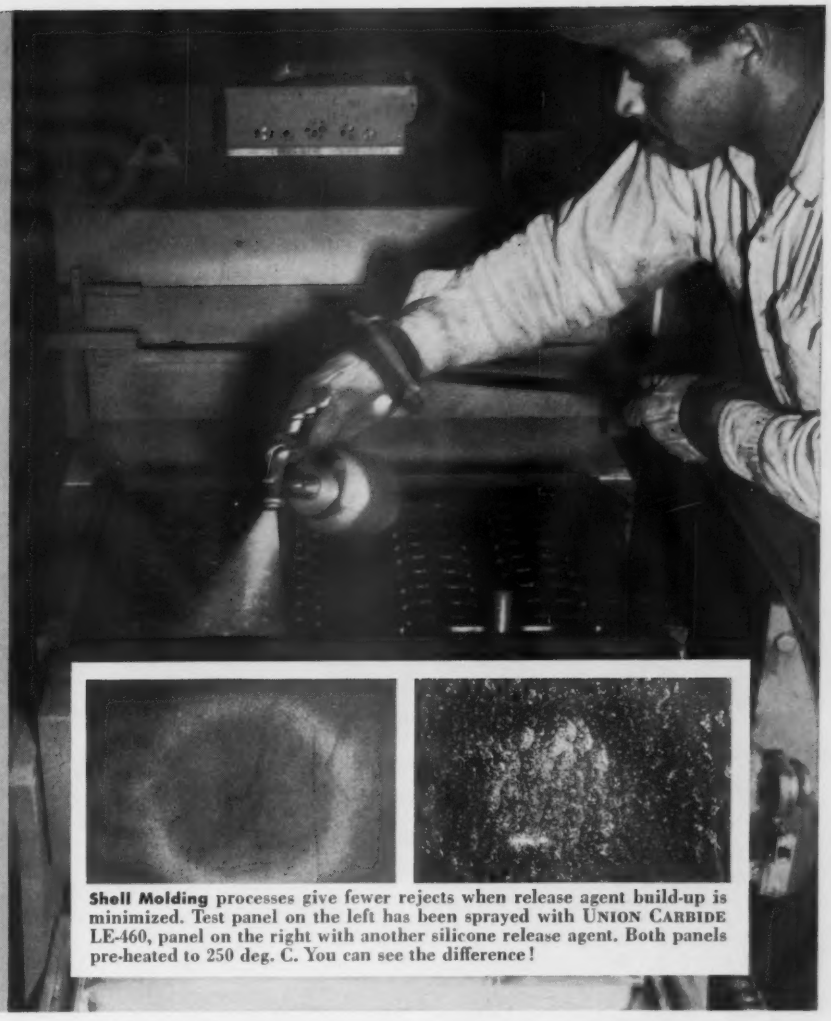
Microcast Div., Austenal Inc. has completed a $4 million investment casting foundry at La Porte, Ind. The one-story manufacturing area measures 200 by 400 feet.

General Metals Corp. has moved its executive offices from 220 Bush St., San Francisco, to 550 85th Ave., Oakland, Calif.

Clyde Williams & Co. has been formed to provide industry with services in technical and business

Data from the
SILICONES MAN

COMPARE THE BUILD-UP of these shell molding parting agents



Shell Molding processes give fewer rejects when release agent build-up is minimized. Test panel on the left has been sprayed with UNION CARBIDE LE-460, panel on the right with another silicone release agent. Both panels pre-heated to 250 deg. C. You can see the difference!

This test shows how the wrong release agents can build up and destroy tolerances in your shell molding process. But UNION CARBIDE LE-460 Silicone Emulsion release agent does not build up. With LE-460 Emulsion you get improved release, fewer rejects. And less time is lost for mold cleaning.

A unique process is used in compounding UNION CARBIDE LE-460 Silicone Emulsion. The result: even dispersal of the active silicone ingredient over the entire pattern surface—even when diluted with water 200 to 1! Water hardness will not cause separation . . . nor will pumping, aeration or repeated freeze-thaw cycles. LE-460 is delivered as a concentrate. You dilute it with ordinary tap water to suit your needs.

Your Silicones Man has a great wealth of information about silicone release agents . . . in the chemistry, properties and many applications of UNION CARBIDE Silicones. Call the UNION CARBIDE Silicones Man today; he has offices in most major cities. Or write for technical literature on "Silicones for the Shell Molding Process." Address Dept. DG-4801, Silicones Division, Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.

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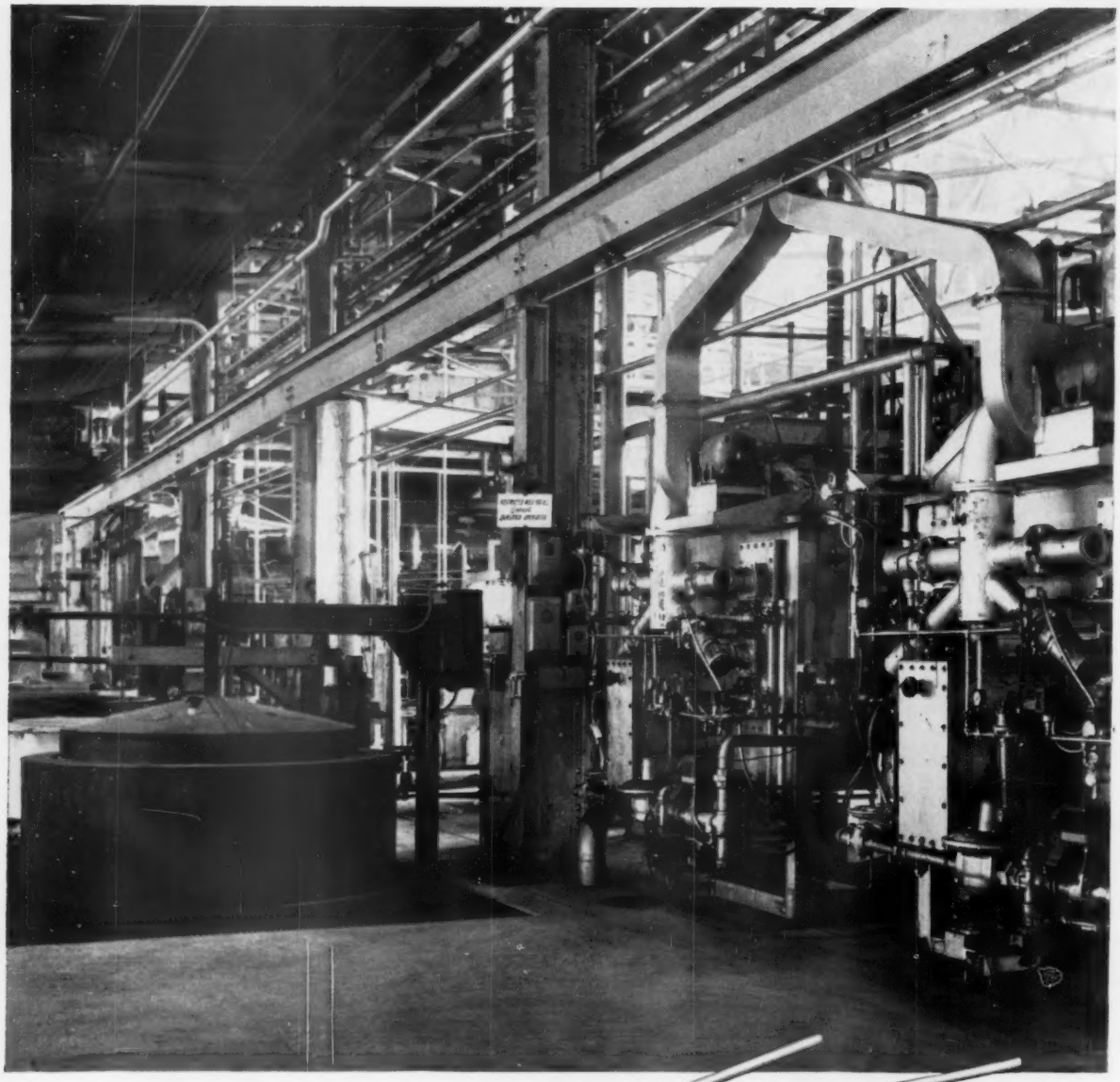

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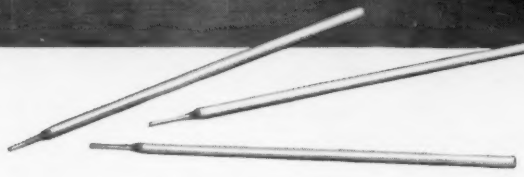

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Circle 616 on Page 51

problems. It is headed by Dr. Clyde Williams, formerly president, Battelle Memorial Institute, and headquarters are at 50 West Gay St., Columbus, Ohio.

Fire Brick Service Co., 305 Missouri Ave., Jeffersonville, Ind., is a new warehouse source of supply for refractories manufactured by Mexico Refractories Co., Mexico, Mo. Telephone number is BUtler 2-2729.

Manning, Maxwell, & Moore Inc., Shaw-Box Crane & Hoist Div., Muskegon, Mich., has opened a district sales office at 1420 Ulster St., Denver 8, Colo. A. A. Steele has been appointed district sales manager.

American Air Filter Co., Louisville, Ky., has opened a central regional sales office on the sixth floor, Michigan Bldg., Detroit. Frank K. Platt, central regional manager, will supervise the office.

Electric Steel Foundry Co., Portland, Oreg., has moved its Denver offices and warehouse into new quarters at 3940 Grape St., Denver 7, Colo. The telephone number is Florida 5-2349.

Richardson Scale Co., Clifton, N. J., has opened a new district sales office at Sewall St., Boylston Center, Mass., with Joseph Vogel as district manager.

Beloit Iron Works, Beloit, Wis., has formed a Foundry & Machine Division and has appointed Bond & Den Uyl Associates, Detroit, to represent the division in Michigan, Indiana, and northern Ohio.

R. S. Furnace Co., Philadelphia, is moving to a new plant at North Wales, Pa. The new facilities will triple the space available in the company's former buildings.

Dike-O-Seal Inc., Chicago, has granted rights for exclusive representation for its products in the New England area to Klein-Farris Co., Boston.

Whiting Corp., Harvey, Ill., has purchased a 40-acre tract of land about a mile south of its main Harvey plant for possible future expansion.

Kramer Brothers Foundry Co., Dayton, Ohio, was damaged by fire on Feb. 20. Firemen estimated that damage would total more than $100,000.

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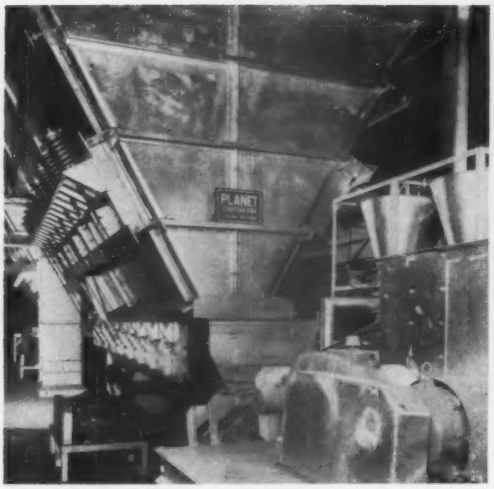
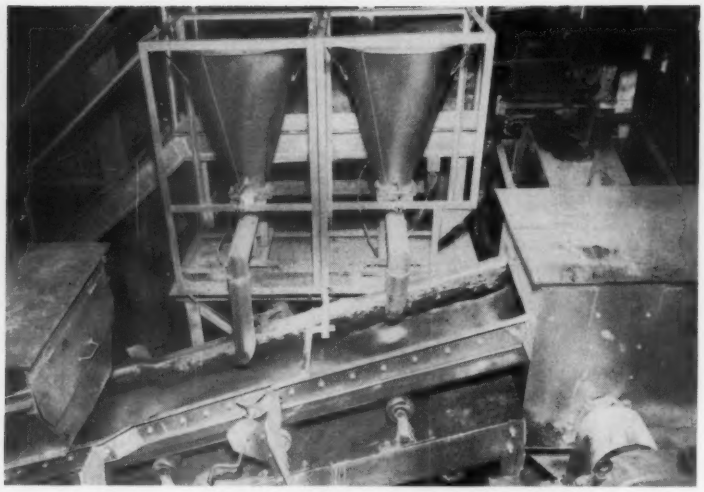


Oscillating feeder under storage bin feeds sand to preparation system



Sand from oscillating feeder falls to a belt conveyor. Probes pick up sand moisture data, and additives are supplied along the belt

Automatic System Conditions . . . Aluminum Molding Sand

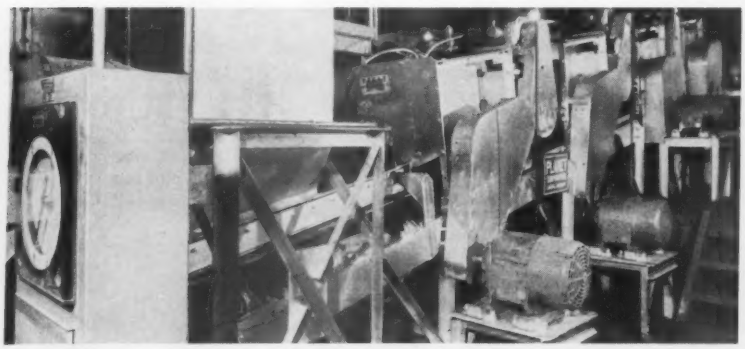
By **ROBERT H. HERRMANN**
Associate Editor

SAND handling and conditioning from shakeout to molding floor have been made completely automatic by a recently installed system at Aluminum Co. of America's green sand foundry in Cleveland. The complete system consists of two identical groups of equipment, one handling sand for the large mold area and the other handling sand for the medium and small mold area.

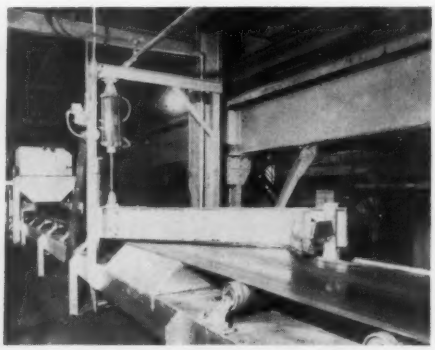
An underfloor oscillating conveyor in each area carries spill and shakeout sand to each of the preparation systems. Each conveyor consists of two oscillating units 48-ft long and three units 60-ft long for a total of 276 ft. A large quantity of sand from vibrating shakeouts and gridded floor openings, over which some molds are broken out, falls first to a 6-ft-long feeder trough mounted on each oscillating conveyor above the conveyor trough. These feeders supply a ribbon of sand 6-in. deep and 36-in. wide to the main conveyor trough and thus eliminate intermittent overloading which might occur when large molds are shaken out. Each conveyor can transport 200 tons of sand an hour.

At the ends of the oscillating conveyors, sand passes under a magnet which removes chills, rods, gaggers, and other ferrous scrap. Sand falls through an opening in the conveyor pan. Ferrous scrap is carried beyond that opening by a belt traveling across the face of the magnet, then is dropped back on a nonmagnetic extension to the oscillating conveyor. Ferrous scrap from both conveyors is carried on an inclined, cleated belt to a sorting area on the main foundry floor.

Sand falls from the oscillating conveyors to a three-deck vibrating screen which breaks up lumps, removes refuse, and feeds screened



A muller belt carries sand and additives at 240 fpm under four mixing units. Water is added between first and second mixers



Air-cylinder-actuated plows remove prepared sand to molders' hoppers

FOUNDREZ 7500 is a very finely powdered thermosetting phenolic resin. You will find that it blends easily, gives uniform shell mold structure and strength in economical sand-to-resin ratios.

When you produce shell molds with FOUNDREZ 7500, you reduce curing cycles. This remarkable RCI resin performs satisfactorily at extremely high oven temperatures, lets you turn out more molds per hour.

While FOUNDREZ 7500 works well in almost all applications, it is especially recommended for tough and intricate jobs where the patterns have a deep draw, and where the sand must flow, fill and bake extra well.

FOUNDREZ 7504 is very similar to FOUNDREZ 7500 but is faster setting and intended for use in high speed production. It generally gives a more rigid shell mold than FOUNDREZ 7500.

For large and small parts cast with any ferrous or non-ferrous material, shell molding with FOUNDREZ 7500 and 7504 is ideal... particularly for long production runs. For technical help or complete information, write to RCI Foundry Division in White Plains.

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REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

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sand to a 30-in. conveyor belt and thence to a bucket elevator. Refuse from the screen is carried by inclined belt conveyor to the main foundry floor and dumped into a rotary screen. Larger pieces of aluminum from this screen and smaller pieces from a second screen are salvaged for remelting.

Bucket elevators of each system empty sand to belt conveyors over separate hoppers of 200 tons capacity each. Three plows remove the sand, thus aiding uniform loading of the hoppers, which are rectangular and about 20-ft long. An oscillating feeder under each hopper supplies an even flow of sand at the rate of 160 tons an hour to a 30-in.-wide belt. Probes suspended in the sand along the belt supply data on moisture conditions of the sand to an automatic water addition unit which is being adapted to use in the system. Beyond the probes, clay and cushioning agent additions are made to the sand from vibrating feeders supplied by small hoppers beside the belt.

Sand and additives from the feeder belt are discharged to a 30-in.-wide muller belt traveling at 90 degrees to the feeder. The muller belt, traveling at 240 fpm, carries the sand under four mixing units. Water is added between the first and second mixers, and 18-in.-diam rollers between the second and third, and third and fourth mixers exert a shearing-mulling action on the sand. They rotate at a surface speed about 10 per cent faster than the speed of the muller belt.

Each mixer consists of two reels 16-in. in diam and 30-in. long. They resemble the reel on a lawn mower. The reels are mounted in a vented, rectangular enclosure so that the reel blades almost touch the muller belt. They rotate at 720 rpm in the same direction as movement of the belt, thus providing the mixing action. The second reel in the final mixer has spokes instead of blades to aerate the sand.

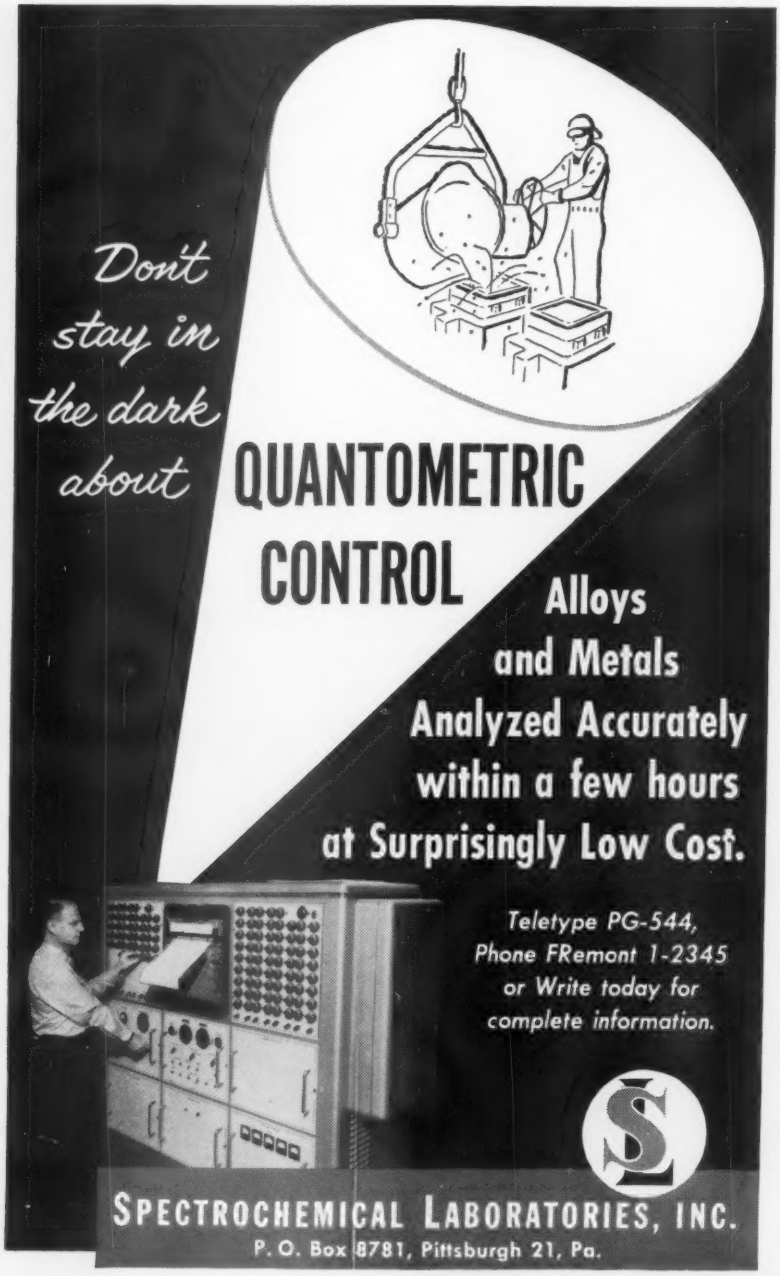
Prepared sand from one of the sand systems is discharged to a 30-in.-wide, 240-ft-long distributing belt moving at 240 fpm over the floor molding area for large molds. Nine air - cylinder - actuated plows controlled by an operator on a catwalk plow sand into sandslinger hoppers or to storage hoppers serving hand molders.

The second system feeds an identical distribution belt which supplies slinger and molders' hoppers. The pneumatically-operated plows on this belt, however, are controlled automatically by level determiners in each hopper.

Each half of the system is designed to operate automatically and independently of the other. The components in each half are interlocked by electrical controls; if something goes wrong with any phase of its operation, the rest of the unit will stop to prevent a pile-up of sand at any point. Furthermore, the equipment returning used sand to storage hoppers for each half is interconnected to obtain cross feed if it is desired.

Other features of the system include separate bag-type dust collectors for each half, with all sand transfer points hooded and vented. Idlers on all conveyor belts are equipped with sealed-for-life bearings. An important point is the fact that the oscillating conveyors, hoppers, chutes, and troughs throughout the system are lined with stainless clad steel. Use of that metal reduces pitting and other deterioration.

The Planet Corp., Lansing, Mich., acted as general contractor for installation of the system.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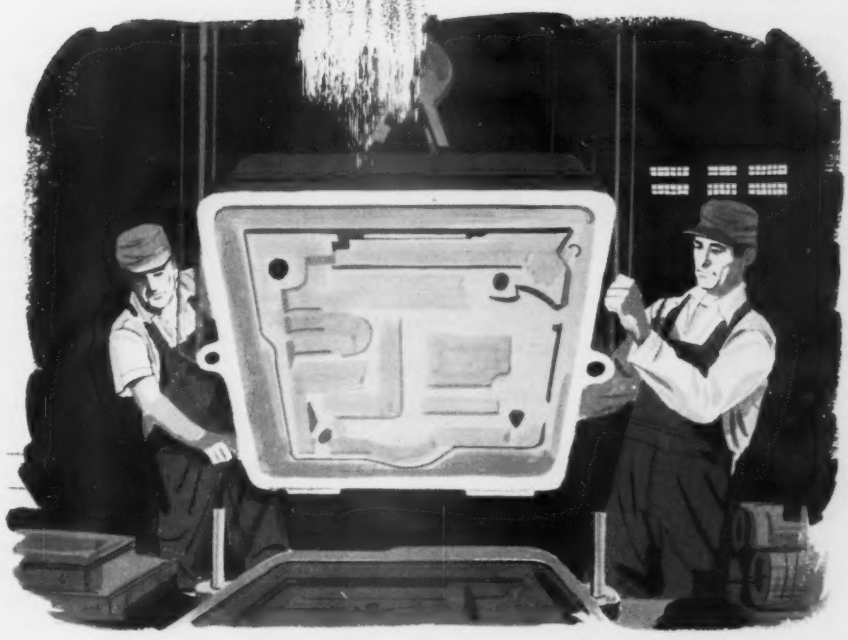

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Foundry Developments

By EDWIN BREMER
Metallurgical Editor

PUBLICATION recently made available is "Methods of Testing Thermocouples and Thermocouple Materials" by W. R. Roeser and S. T. Lonberger. Designated National Bureau of Standards Circular No. 590, it may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, for 20 cents. It is concerned mainly with calibration of platinum versus platinum-rhodium, copper-constantan, Chromel-Alumel, and iron-constantan thermocouples. Some guidance is provided in selection of a test method best adapted to a given set of conditions.

Fires Away

ELECTRON gun bombardment in a high vacuum is the basis of a new process for melting chemically-active materials with high melting points. Conceived by Temescal Metallurgical Corp., Richmond, Calif., the process is owned jointly by that firm, Stauffer Chemical Co., and Mallory-Sharon Metals Corp.

In the process, which is based on high-vacuum techniques, the electron gun serves as the cathode and bombards the melt stock, forming the anode, with electrons causing it to melt. Molten metal drops into a water-cooled crucible below in which heat required to maintain a molten pool also is provided by electron bombardment. Melt material may be in ingot, powder, flake, or sponge form. Level of vacuum employed is in the range 0.10 to 0.10 microns.

It is reported that the process results in final products of high purity with properties not attainable by other methods.

Aluminum Welding

THREE inert-gas welding techniques for aluminum are reported by Kaiser Aluminum & Chemical Corp., Oakland, Calif. In one method a mixture of argon and chlorine is introduced through the contact tube directly into the inner core of the arc. In another, nitrogen replaces inert gas in the shielding atmosphere and low-flow inert gas is used in the contact tube. In the third, a low flow of inert gas such as argon containing a small amount of chlorine is used in the contact tube with a low flow of inert gas through the nozzle in the outer shield.

Strong Alloy

UTILIZATION of titanium scrap is one of the major problems of the industry, and studies are being made of its use as a hardener for alloys. In one investigation using titanium scrap to form a copper-6 per cent titanium alloy, mechanical properties in the as-cast and heat treated states were studied. When heat treated, the alloy's tensile properties were exceeded only by those of beryllium copper.

Optimum mechanical properties for cast copper-6 per cent titanium alloy were obtained after solution treatment at 1625° F, water quenching and age hardening at 800° F. Average properties were 121,000 psi tensile, 107,000 psi yield (0.2 per cent offset), 8.0 per cent elongation (2-in. gage), and 18 per cent reduction in area.

Details are presented in "Age-hardening Characteristics of a Cast Alloy of Copper-6 Per Cent Titanium" by Hehner, McCurdy and Edelman. Designated PB 131297, the report may be obtained from the Office of Technical Services, U. S. Department of Commerce, Washington 25, for 50 cents.

Brake Joins Wheel

SUCCESSFUL techniques for mechanical bonding of die-cast aluminum automobile wheels to gray cast iron brake drum liners have been developed by Dohler-Jarvis Division, National Lead Co., New York. The process, termed B.M.I., is said to effect a strong bimetallic interlock between wheel and drum, and raises heat transfer efficiency in braking action. According to Doehler-Jarvis engineers test results have shown that the bimetallic interlock bond has outstanding tensile and shear strength. The mechanical bond is reported to be ductile and superior to a metallurgical bond on die castings in the uniformity of its properties.

Procedure is to insert a centrifugally-cast gray iron brake drum into the die cavity of a die casting machine. Die is closed and molten aluminum is injected under pressures of 6000 to 10,000 psi to form the wheel and bond it to the brake drum.

Combines Methods

ENTIRELY new concept in precision fabrication is reported by Casting Engineers Inc. Division, Consolidated Foundries & Mfg. Corp., Chicago. In the process an investment casting will be used to provide a precision blank which will be worked by such additional high-precision, high - production techniques as coining, cold heading, etc., to produce a lower cost finished part with greatly superior physical and dimensional characteristics.

Protects Magnesium

STUDY of protective coatings for magnesium alloys led to development of three air-drying coating systems, one "preferred" and two alternates, for effective protection against the high humidity and high temperature (to 500° F) conditions encountered by high-speed aircraft. Preferred coating is a calcium chromate pigmented primer in an epoxy-polymide vehicle and an aluminized topcoat. Drawback is lack of color retention at high temperatures. Alternate systems, while inferior in humidity and temperature resistance, have better color retention.

Vehicles of the alternates are styrenated acronitrile modified alkyd-silicon copolymer resin, and a mixture of an epoxy ester and a silicone resin. Details are available in "High-Temperature Protective Coatings for Magnesium" by Fitzgibbon, Miller, and Glaser. Designated as PB 131073, the report may be secured from the Office of Technical Services, U. S. Department of Commerce, Washington 25, for $3.

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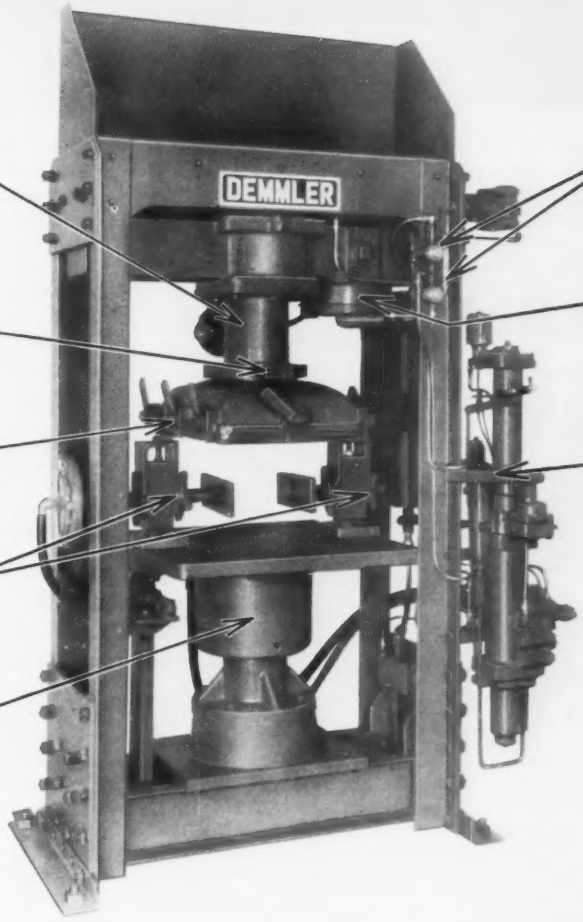
A YEARS-AHEAD DESIGN BLOWS OR SHOOTS ANY TYPE CORES FROM OUNCES TO 10 POUNDS IN WOOD OR METAL BOXES



Latest Sleeve-Type Stationary Magazine: Slot design for most efficient operation; suitable for all core sand mixes.

Shoot Heads: Interchanged in seconds; no wrenches needed.

Quick-Change Blow Plate: Cam-operated clamps; no wrenches needed.

Horizontal Clamps: Quickly adjustable, horizontally and vertically without wrenches.

Fully-Enclosed Draw Mechanism: Six-inch accurate draw stroke.

Table Height Adjustment: Push-button operated, eight-inch hydraulic adjustment.

Fast-Acting Large Size Diaphragm-Type Blow Valve: Easily replaceable diaphragms are the only wearing parts.

Automatic Sequence Control: One push of operating lever puts machine through a complete cycle.

Safety Controls: Machine is inoperative unless core box is properly located.

GET MORE FROM YOUR FOUNDRY DOLLAR

The new DEMMLER 70 is a low-cost, high-speed production machine, ruggedly constructed for heavy-duty use. Maximum versatility and ease of maintenance make this DEMMLER core blower a profitable addition for your foundry. Write us for more information. DEMMLER — since 1909 — the first name in core blowers.

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PRECISION CORE BOX VENTS

Demmler is by-far your best source for precision core box vents, manufactured by specialists who pioneered in the core blower industry. Many sizes, slot widths and screen meshes are available in brass and steel core box vents.

Circle 636 on Page 51

HL 150 MESH VENTS

A new general purpose vent which practically eliminates the cleaning coarser screens demand. Write for literature on Demmler vents.

Among those on the conference program were, left to right, rear row: Theodore Kramp, Oliver Pells, Earl Strick, Arthur Johnson, James H. Lansing. Front row: Richard W. Crannell; E. F. Chojnowski, H. J. Weber, William Illuminati, and Gordon B. Mannweiler, chairman of the program committee

MALLEABLE FOUNDRY OPERATIONS *Discussed at Society's Conference*

By **WILLIAM G. GUDE**
Managing Editor
and
JACK C. MISKE
Associate Editor

OPERATING practices and certain fundamentals connected with them were among the topics discussed at the annual Technical and Operating Conference of the Malleable Founders' Society. The meeting, held at the Wade Park Manor, Cleveland, Feb. 6-7, had an attendance of more than 100. Gordon B. Mannweiler, Eastern Malleable Iron Co., Naugatuck, Conn., headed the committee in charge of the program.

Malleable Finishing Practice was considered from the standpoints of the jobbing shop and the mechanized foundry. Speaking for the former, Earl Strick, Erie Malleable Iron Co., Erie, Pa., recommended obtaining of complete information from the customer as to tolerances, dimensions, etc., for the guidance of the finishing department. He also stressed the importance of proper location of equipment and flexibility of material handling.

The correct mixture of shot for blasting prolongs the life of shot and equipment, improves casting finish, and speeds cleaning. A rigid schedule should be followed for equipment lubrication and maintenance. Good housekeeping promotes safety; it has been a big factor at Erie Malleable where the finishing department has been accident-free for four years.

Gordon Snoeyenbos, Wagner Malleable Iron Co., Decatur, Ill., described its mechanized foundry cleaning practice. Grinding is restricted as much as possible because shearing provides closer tolerances and less opportunity for operator error. It also offers economies on large gates and pearlitic malleable. About 35 per cent of all gates are sheared at this plant. Application of heat on certain shearing operations has been found useful in minimizing tool breakage.

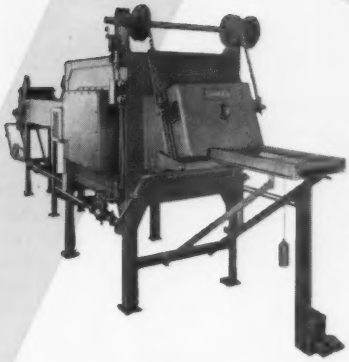
Industrial Engineering included two talks. Thomas M. Blank described operations of Pennsylvania Malleable Iron Corp.'s new plant at Landisville, Pa. Termed a conventional type foundry, it employs 20 molders in making small castings, and melts in a 30-ton, coal-fired air furnace. Molding occupies 6 hours, pouring 1½ hours. About half of the cores used are the CO_2 type. Six annealing kilns are employed. If the foundry's facilities are suited to the type of work in which it specializes, Mr. Blank believes that the well run conventional type foundry can match the costs of the mechanized shop.

Malleable Engineering for the Operating Man was treated by three talks. Prof. Richard Schneidewind, University of Michigan, discussed the metallurgical aspects of the production of malleable iron and the controls used in its production. He predicted the eventual successful production of malleable iron castings in much heavier sections than are common today.

The meaning of such mechanical properties as tensile strength, yield strength, and elongation was explained by W. K. Bock, National Malleable & Steel Castings Co., Cleveland. He also pointed out some of the shortcomings of values obtained from test bars in measuring the serviceability of a casting.

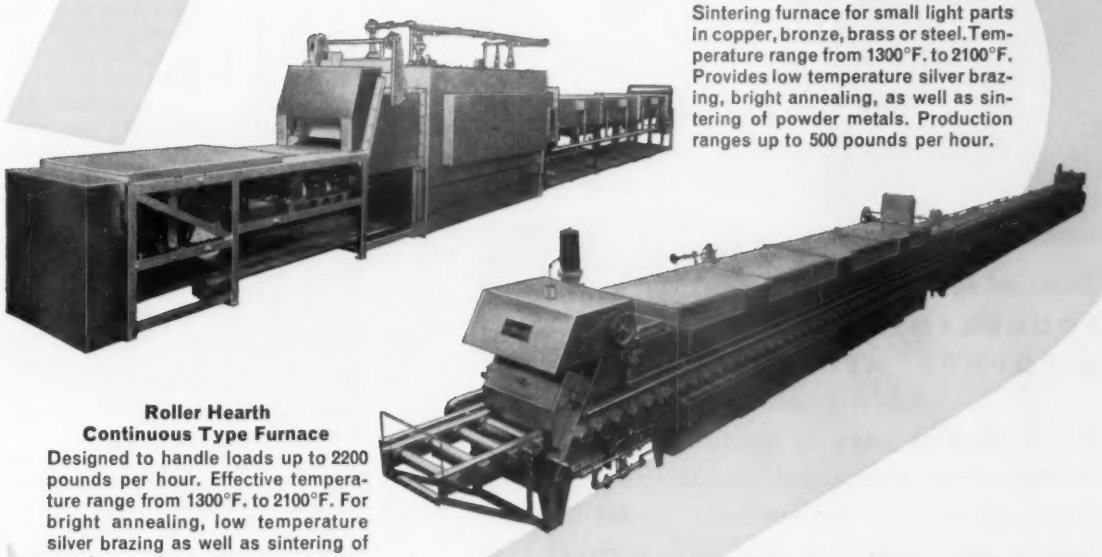
Effect of operating practices on casting properties was discussed by Carl F. Joseph, Central Foundry Div., General Motors Corp., Sagi-

Look to Lindberg for sintering furnaces



Hand Pusher Batch Type Furnace
For small production lots and experimental sintering. An all-purpose unit for operation from 1300° F. to 2500° F. Made in various sizes for sintering from 25 to 300 pounds per hour.

Mesh Belt Continuous Type Furnace
Sintering furnace for small light parts in copper, bronze, brass or steel. Temperature range from 1300°F. to 2100°F. Provides low temperature silver brazing, bright annealing, as well as sintering of powder metals. Production ranges up to 500 pounds per hour.



Roller Hearth Continuous Type Furnace
Designed to handle loads up to 2200 pounds per hour. Effective temperature range from 1300°F. to 2100°F. For bright annealing, low temperature silver brazing as well as sintering of powder metals.

Lindberg atmosphere generators provide the proper atmospheres recommended for use with Lindberg Sintering Furnaces. These are: 1. HYEX Generator... approximately 4% carbon dioxide—18% hydrogen—12% carbon monoxide and 66% nitrogen. 2. HYEN Generator... neutral atmosphere approximately 21% carbon monoxide—40% hydrogen—38% nitrogen and 1% methane. 3. HYAM Generator... composed of approximately 75% hydrogen and 25% nitrogen.

For sintering furnaces, just as in all types of industrial heating equipment, you can depend on Lindberg's ability to supply exactly the right equipment for your needs. Just get in touch with your nearest Lindberg Field Representative, or write Lindberg Engineering Company, 2453 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California.

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You'll find it pays to standardize on Acme melting pots and ingot molds. They reduce down time and replacement costs because they're cast from a special iron formula that combines strength with high temperature resistance. They improve quality and reduce rejects, too, because they're designed for even heat distribution without hot spots. If you melt any non-ferrous metals, take advantage of our more than 30 years' experience in this field. It's your assurance of consistent high quality in Acme melting pots and ingot molds . . . designed *by* foundrymen, *for* foundrymen.

Quick delivery anywhere in the United States.
Write for size list showing 40 standard sizes.

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naw, Mich. These operations included molding methods and melting. High humidity of the cupola blast raises hydrogen content of the metal and retards annealing. Composition of raw materials also influences physical and mechanical properties of the casting; graphite flake structure in pig iron, for instance, affects nodule size in the casting.

Malleable Founders' Sponsored Research, described by Dr. L. C. Marshall, Link-Belt Co., Indianapolis, covered three projects. One is a study of basic properties of malleable iron. Another is an investigation of stress and creep rupture properties at elevated temperatures. The third is a study of the machinability of malleable iron, using a strain gage dynamometer. This work, already well advanced, also is intended to determine the best tool design for maximum life.

Molding Sand Fundamentals—Clyde A. Sanders, American Colloid Co., Chicago. Hot sand and lack of adequate mulling are the most common causes of sand problems. As sand gets hotter, its properties change with increasing moisture, and southern and western bentonite act more and more alike. The entire industry should go to colder sands—preferably at room temperature. Facing sand pays for itself in inspection, cleaning, and scrap savings. Its use is common in Europe. Too many foundries don't increase sand capacity as their casting production rises.

Sand Preparation, Use, and Control in a Jobbing Foundry—Arthur Johnson, Northern Malleable Iron Co., St. Paul. Every foundry must work out its own sand practice based on the type of work being done and the local sands available. Northern Malleable has been able to buy satisfactory sands from its own general area. The company runs daily, weekly, and monthly tests for sand properties and records results graphically. When trends show up, they are investigated and corrected. Each plant should set up a sand control system and stay with it.

Sand Preparation, Use, and Control in a Mechanized Foundry—Oliver Pells, Grabler Mfg. Co., Cleveland. Grabler operates five foundries at one location, including two for gray iron, two for malleable iron, and one for brass. Each employs the sand practice which works best for it, using the most economical materials available. The company varies its sand treatment and tests for its different operations and castings. It finds that carelessness is the cause of most scrap. This

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BOOTH 1548

(LAKESIDE HALLS)

and let's talk about...

THE BROADEST LINE OF RESINS FOR EVERY TYPE OF SHELL MOLDING PROCESS... BACKED BY APPLICATION KNOWLEDGE BASED ON VAST FOUNDRY EXPERIENCE AND RESEARCH DEVELOPMENT.

Monsanto®

Monsanto Chemical Company
Plastics Division,
Springfield 2, Mass.

Circle 639 on Page 51

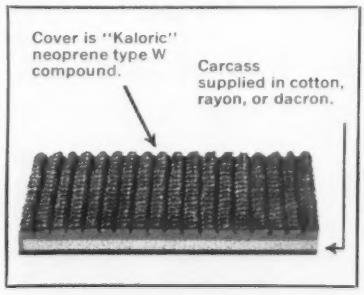
Kaloric belt installation conveying hot coke.

Quaker Kaloric conveyor belting WON'T HARDEN OR CRACK AT 325° F. Special cover doubles belt life

Hot-materials handling jobs can take a terrific toll in conveyor belting, unless the belt is expressly chosen for *specific* job conditions. And Quaker Kaloric—a conveyor belting which combines these "custom" qualities with a remarkable, heat-resistant cover—can actually cut your maintenance costs in *half*.

Here's why: Kaloric covers are sturdy neoprene type W compound, supplied with smooth or rough top finish of any thickness. Available any length, with any number of plies in widths up to 72". And there's a skim coat between plies for insulation and extra flex-life. Carcasses come in your choice of cotton, rayon, or "dacron," depending upon requirements of application.

Quaker Engineering Service, designed to help you determine which belt best fills your needs, is available through your Quaker distributor. See him soon. Or write *Quaker Rubber Division, H. K. Porter Company, Inc., Philadelphia 24, Pa., or Pittsburg, California.*



H. K. PORTER COMPANY, INC.

QUAKER RUBBER DIVISION

carelessness is exemplified by badly set cores, sand from molders' gloves, loose sand from hoppers, misalignments, shifts, and similar problems.

Factors Affecting Malleable Casting Application—J. W. Rhoads, Axle & Transmission Div., Chrysler Corp., Indianapolis. Foundrymen must keep machining problems in mind. When they don't, customers will look for other forms of fabrication that will solve their problems. This point is particularly true for smaller castings with precise tolerances. Consistent results are needed.

Forging practice also has failed to keep pace with other manufacturing processes, and many forgings have been converted to castings. Any manufacturing process is applied only as long as it produces required characteristics uniformly. The foundryman must keep pace with finishing progress, or he will lose out. Foundries need imagination, vision, and progress. New engineers should be used to do the job. Foundries also need transfer systems to link mechanical operations and take full advantage of the new processes available to them.

Malleable-Base Spheroidal Graphite Iron—E. F. Chojnowski, Albion Malleable Iron Co., Albion, Mich. Increasing sulfur content in malleable iron also increases spheroidal qualities of the graphite. Heat treating spheroidal graphite malleable takes no longer than for pearlitic malleable, but requires a different atmosphere. This metal is cast white and annealed. It has good machinability, high modulus of elasticity, and a uniform matrix. It can be cast into both thin and thick sections without mottling, uses no critical or expensive materials, and has less tendency to hot tearing. It is a true alloy.

Noise Control—H. J. Weber, American Foundrymen's Society, Des Plaines, Ill. Workmen's compensation originally was concerned with injuries which caused inability to work, but it now is being extended to include loss of hearing with no loss of ability to work. Foundrymen should look for ways to cut noise in their plants, but there are few easy ones. Vibration mountings, rigid, sealed enclosures, and multiple enclosures are some possibilities.

European Malleable Foundry Automation — William Illuminati, American Automation Corp., New York. Automatic molding and pouring installation at George Fischer Ltd. malleable foundry in Schaffhausen, Switzerland, produces up to 300 molds per hour with nine men, not including coresetters.

Circle 640 on Page 51

in '58 the call is for *Famous*

CORNELL

CUPOLA FLUX

Famous Cornell Cupola Flux is a scientifically prepared mixture of high grade fluorspar and other materials which cause a chemical reaction in molten iron . . . which reduces scrap losses, gives greater tensiles—increases fluidity of slag—guarantees complete cleansing of coke. Increased life of lining both in cupola and ladles alone will more than cover cost of Famous Cornell Cupola Flux. Metal is cleaner, sulphur is reduced. Write for Bulletin 46-B.

"often imitated but never equalled"

The Benefits . . . The Advantages of *Famous* CORNELL Aluminum and Brass Flux

Makes metal pure and clean.

Permits use of more scrap without danger of dirt, porous places or spongy spots due to dirty metal.

Thinner, yet stronger sections can be poured.

Metal does not cling to the dross, as readily.

Crucible or furnace linings are kept clean and preserved.

Cleanses molten brass (whether red or yellow) even when the dirtiest brass turnings are used.

Saves considerable tin and other metals.

Forms a perfect covering over the metal during melting, prevents oxidation and reduces obnoxious gases to a great extent.

Write for Bulletin 46-A.

The CLEVELAND FLUX Company

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Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL LUXES

Trade Mark Registered

Circle 641 on Page 51

AVOID CASTING FINS IN SHELL MOLDING

Fins are for fish, not for castings. Here are five suggestions that will help you avoid them.

1. Improve bonding practice. Position second mold half before bonding adhesive begins to cure. If shell is too hot, lower pattern temperature or allow shell to cool before applying bonding resin.

2. Clean mold surfaces before assembly. Loose sand or other foreign materials won't let shell halves press firmly together.

3. Clean pattern; avoid lubricant buildup. Any buildup on the pattern creates a cavity with respect to the mold. Likewise, pattern depressions create high spots that prevent flat mating of mold halves.

4. Check for warped shells. These seldom fit together perfectly even when bonded.

5. Resin should be fully cured. For a perfectly flat shell there must be no rubberiness at ejection. Otherwise, shell mating must be accomplished quickly.

Another helpful hint for better shell molding: use G-E shell resins. You can depend on them—and on the practical experience of G.E.'s technical service specialists. Some of this experience has been summarized in a brochure, "59 Answers to Your Shell Molding Problems." For your copy write General Electric Company, Section F18, Chemical Materials Dept., Pittsfield, Mass.

Progress In Phenolics

GENERAL ELECTRIC

Circle 643 on Page 51

FOUNDRY EQUIPMENT AND SUPPLIES DIGEST

For More Details on These Items Use Reply Card —Page 191

LIQUID CORE PASTE

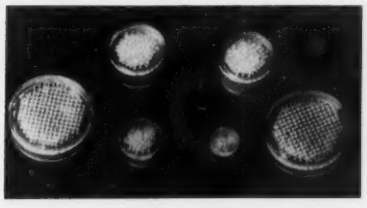
Improved version of the company's Fastick liquid core paste reportedly has these new advantages: 1. Drying time has been speeded up by 10 per cent. 2. Flowability has been improved so that the paste pours in a smooth, steady stream. 3. Economy is increased because less of the core paste is required to do a given job.

The new paste is said to be usable with equal efficiency and economy on CO_2 cores, shell molds, resin-bonded cores, and oil-sand cores. Any foundry interested in testing the new core paste will be sent a free 1-lb sample in a squeezable polyethylene container on request.—**Frederic B. Stevens Inc.**, 1800 18th St., Detroit 16, Mich.

For More Details Circle No. 401—Page 191

PLASTIC COREBOX VENTS

Bi-Vents are self-cleaning plastic corebox vents, said to be ideal for quick replacements in present coreboxes and blowplates. They are made 0.005 to 0.008 in. oversize for



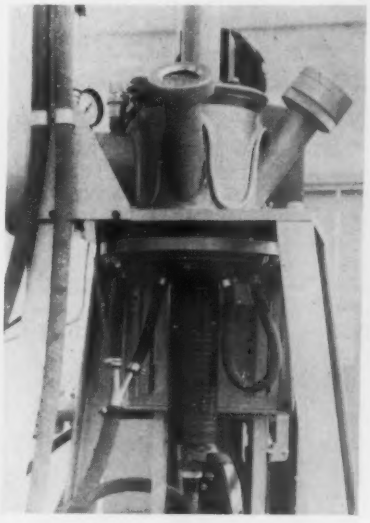
easy press fitting without special tools. These vents can be contoured to the shape of the box within the limits of the depth of the hole—3/32 in.

They can be mounted on vertical sides of coreboxes and reportedly will not distort cores or restrict their removal. Vents remain open approximately 80 to 90 per cent of original capacity through constant use. They are acid, oil, and steam resistant and eliminate mudding and patching because sand does not adhere to them.—**Better Foundry Products**, 10901 Vernon Ave., Chicago 28, Ill.

For More Details Circle No. 402—Page 191

VACUUM/ARGON ARC FURNACE

Furnace for pure melting of refractory metals and alloys uses a



direct arc as the heat source and a watercooled copper hearth as crucible material. With this arrangement, specimen buttons of refractory metals such as tungsten and molybdenum can be prepared in a low-pressure argon atmosphere. Reactive metals such as titanium and zirconium can be melted and cast in a vacuum by the consumable electrode technique; thereby the material being melted forms the actual electrode. Ingots 1¾ in. in diam and 10½ in. long can be cast.

Capable of use for both consumable and nonconsumable electrode work, this laboratory scale arc furnace normally is operated from a 600-amp dual continuous control arc welding generator. The equipment is completely self-contained and occupies 4 x 4 ft of floor space. It is 9 ft high. Vacuum gages and other electrical instruments are built into a separate pedestal cabinet.—**Edwards High Vacuum Ltd.**, Manor Royal, Crawley, Sussex, England.

For More Details Circle No. 403—Page 191

TURNTABLE

Heavy-duty turntables with capacities up to 10,000 lb are supported on six heavy casters. Under-

side of the table has a turned raceway to permit easy rolling of top deck. These turntables can be used individually or inserted in a conveyor line. Spring-loaded stops can be supplied at 90 or 180-degree points.—**Sage Equipment Co.**, 30 Essex St., Buffalo 13, N. Y.

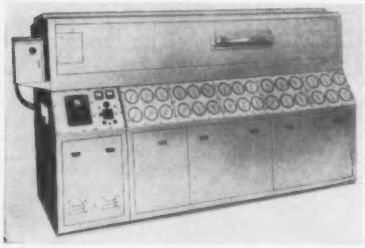
For More Details Circle No. 404—Page 191

DIRECT READING SPECTROMETER

Direct-reading spectrometer reportedly completes analysis of ferrous and nonferrous metals within 30 seconds and instantly registers concentrations of up to 30 alloying elements simultaneously on easily read dials.

Called the Atomcounter, it features fingertip control of all opera-

tions, safety-interlocked circuits, easily serviced plug-in components, and extreme temperature stability. Design of the instrument permits



optional film recording of the analytical spectrum as well as conventional direct reading analysis—or use of both methods together. A modified 1.5 meter model is available for applications involving only nonferrous materials. — **Jarrell-Ash Co.**, 26 Farwell St., Newtonville 60, Mass.

For More Details Circle No. 405—Page 191

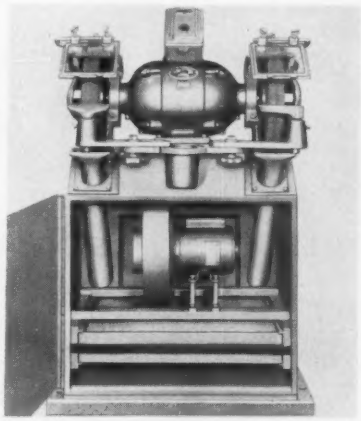
WELDING AND CUTTING

Welding and cutting outfit offers low-cost versatility. It does welding, cutting, heating, brazing, soldering, and, with special tips, scarfing, rivet cutting, and gouging. Welding range with tips supplied in kit is 1/32 to 3/8 in., but nine other tips are available to increase this capacity to 7/8 in. Cutting range with correct accessory tips is from 1/8 to 4 in. Tips can be changed in six seconds, and a "Flo-Trol" diaphragm is said to stop causes of backfire, eliminate seat burnout, and reduce downtime.—**Smith Welding Equipment Corp.**, 2633 S. E. Fourth St., Minneapolis, Minn.

For More Details Circle No. 406—Page 191

GRINDER AND COLLECTOR

Model 504 grinder with built-in dust collector is available in 1, 2, and 3-hp models. The dust collector is built into the base which forms the pedestal of the company's Model 500 general-purpose grinder. It removes dust and abrasive particles from the air and draws the polluted air into a filter cabinet, where heavy



particles are deposited. Air then is directed upward through a fiberglass pad and returned to the room from the top of the cabinet. Suction fan and 3/4-hp motor operate in clean air. The unit is rated at 1000 cfm, 4-in. pressure.

The grinder itself is 32 1/2 in. wide and 20 in. deep. It features a totally enclosed motor; a pushbutton starter with overload protection; enclosed, adjustable wheel guards; dustproof, antifriction, permanently sealed bearings; tool tray; and lift-out water pot.—**United States Electrical Tool Co.**, 3640 Llewellyn St., Cincinnati 23, Ohio.

For More Details Circle No. 407—Page 191

PNEUMATIC TOOL

Model 1AE rotary-vane type pneumatic tool is particularly suited for finishing patterns, molds, dies, etc. Its angle-drive design, compactness, and small size permit its use to finish hard-to-reach areas.

The tool can be used with a flexible disc holder with contour sanding discs up to 4 in. in diam, with carbide burrs, or with mounted wheels of various sizes. An Erickson 300 Series collet chuck is standard. Maximum free-running speed is 12,000 rpm.—**Doeden Tool Corp.**, Sherwood, Ohio.

For More Details Circle No. 408—Page 191

ALUMINUM ALLOY

Aluminum diecasting alloy is recommended where it is advantageous to provide integral bearing surfaces instead of cast-in or specially assembled bearings or bushings. It will withstand loads of 1500 psi. Tin, lead, and cadmium in the alloy are said to provide a combination of good casting characteristics, mechanical properties, and bearing qualities and to improve machining characteristics. Tensile and yield strengths on a typical specimen are 36,000 and 20,000 psi respectively.—**Aluminum Co. of America**, Room 731, Alcoa Building, Pittsburgh 19, Pa.

For More Details Circle No. 409—Page 191

SCREW CONVEYOR DRIVE

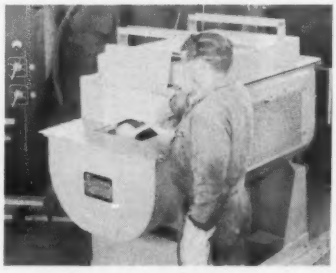
Screw conveyor drive is said to be easy to mount and adjust on standard conveyor troughs. It consists of a speed reducer with packing gland and driving shaft, which mounts on the trough end. The company also offers trough ends in sizes to fit most standard conveyors.

Maximum efficiency is achieved through use of heat-treated steel gears and pinions. Timken bearings are used throughout the drive to provide ample thrust and radial capacity. Design of the drive protects against invasion of the speed reducer unit by material handled on

Electric Resistance Furnace Holds Aluminum

GB electric resistance holding furnaces are designed to facilitate fast production of aluminum castings made by die casting, permanent mold casting, or any similarly automated process. They are made in four capacities from 500 to 2000 lb. Because they are small and compact, they can be positioned close to a casting machine or even under it in some instances.

Power is supplied from a multiple-tap transformer which has a wide range of output to insure absolute metal temperature control. Tests of the unit indicate these operating characteristics: 1. No turbulence in bath. 2. Very low dross formation. 3. Low heat input, great fuel conservation. 4. Resistance elements replaceable during operation. 5. If furnace



freezes because of power failure, charge can be melted out easily without damage to furnace.

Furnace comes as a complete package ready to operate on 220 or 440-v, 3-phase, 60-cycle alternating current, depending on the size.—**Stroman Furnace & Engineering Co.**, 9900 Franklin Ave., Franklin Park, Ill.

For More Details Circle No. 432—Page 191

the conveyor. Drives are available in four sizes and in two ratios—18 to 1 and 8 to 1—in each size.—**Dodge Mfg. Corp.**, Mishawaka, Ind.

For More Details Circle No. 410—Page 191

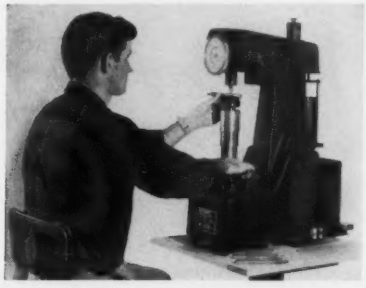
FLANGE-TYPE MOTOR

Pancake motor is stated to reduce motor length up to 60 per cent over standard motors of the same rating. A flange-type motor of conventional radial air-gap design, it achieves its short length through formed end coils and a one-piece housing-bearing bracket. Enclosed and open, dripproof enclosure types are available. Ratings are from 1 to 15 hp at 1800, 1200, and 900 rpm.—**Louis Allis Co.**, Dept. P., 427 Stewart St., Milwaukee 1, Wis.

For More Details Circle No. 411—Page 191

HARDNESS TESTER

Twintester is designed primarily for Rockwell and Rockwell superficial hardness testing applications of materials which require only limited use of hand-operated Rockwell testers. It reportedly is capable of



measuring the Rockwell hardness of metals and alloys of all types, whether hard or soft, polished or unpolished, and round, flat, tubular, or irregular in shape.

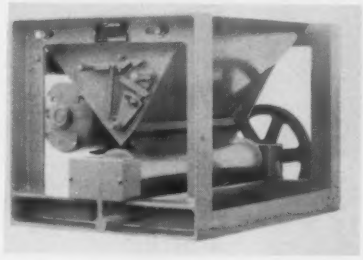
The instrument features a large, direct-reading dial gage with one zero-set position marked with four scales—"B" and "C" to indicate Rockwell hardness and "N" and "T" to indicate Rockwell superficial hardness readings. Vertical capacity is 8, 12, or 16 in., and its throat depth is 5½ in. Bench space required is approximately 12 x 20 in.—**Wilson Mechanical Instrument Div., American Chain & Cable Co.**, 929 Connecticut Ave., Bridgeport 2, Conn.

For More Details Circle No. 412—Page 191

MAGNETIC SEPARATOR

Rotating-field magnetic separator was developed to remove magnetic materials from dry, granulated substances. No moving parts are exposed to the materials being separated. The magnetic field is created by permanent magnets revolving within a stainless steel cylinder. Horsepower required to drive the unit is said to be extremely low.

Separators are offered in a 6-in.



model designed primarily for laboratory use and in 18 and 36-in. models for industrial use. The 18 and 36-in. units can be stacked to give either multiple passes or to be fed separately to give larger tonnage throughput.—**Carpco Mfg. Inc.**, P.O. Box 3272, Jacksonville 6, Fla.

For More Details Circle No. 413—Page 191

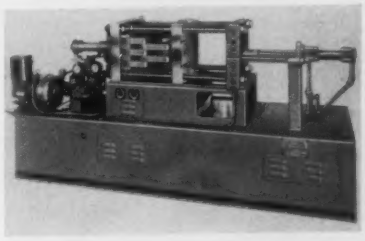
HOLE INSPECTION DEVICE

Device for inspecting cavities in machinery, dies, and other products is said to save costly disassembly work. A lens bulb shoots a concentrated beam of light into a hole too small to permit insertion of a light probe. A mirror ⅛ in. in diam is available for side viewing holes from 0.125 in. up, and side viewing adapters are available with diameters from 0.123 to 0.5 in. A five-power telescope brings the image closer to the inspector's eyes. Another inspection device has 47 tiny lenses inside a flexible tube, the end of which is moved around corners by a control wheel so that almost all areas of a cavity can be seen. **Eder Instrument Co.**, Dept. 200, 2293 Clybourn Ave., Chicago, Ill.

For More Details Circle No. 414—Page 191

DIECASTING MACHINE

Model 150A is a low-cost, high-speed, cold chamber diecasting machine for aluminum, magnesium, and brass. It is said to have all the features of the company's larger models. Shot capacity is 2½ lb at a rate of up to 350 shots per hour.

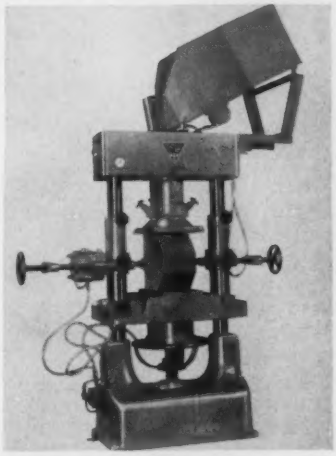


Die thickness is 6 in. minimum and 16 in. maximum. Features include solid block steel toggles, 150-ton locking pressure, automatic electrical cycling at high speed, 20 x 21-in. solid steel die platens, 10-in. shot cylinder stroke, 1½-in. diam plunger tip, and moving platens sup-

Shoots Cores in Wood or Metal Coreboxes

Model KSA 210 V & S coreshooter is said to handle even the most complicated cores of all shapes and sizes and to exert no abrasive action on coreboxes whether metal or wood. Advantages are reported to include fast changeover on short-run jobs, economy of air, and hard ramming that assures high standup cores with the stiffest sand. Shooting cycle is less than 1 second.

Design of the machine eliminates all rotating shafts, bearings, motors, switches, relays, and plows. It operates entirely by compressed air and is completely automatic. Frame is cast steel. Machined steel columns keep shoot plate and table parallel and in alignment. — **Carver Foundry Products Co.**, Muscatine, Iowa.



For More Details Circle No. 433—Page 191

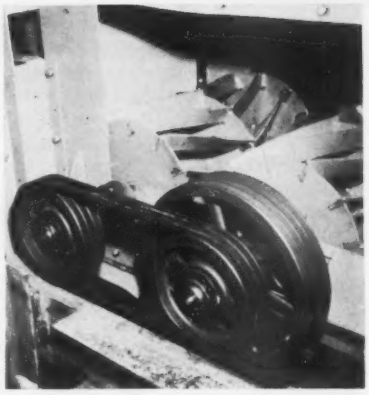
ported by bronze carrier shoes. The machine also is available in a hot chamber type, with hydraulically operated plunger, gooseneck type for zinc, tin, and lead.—**American Die Casting Machinery Co.**, 1744 W. Winona St., Chicago 40, Ill.

For More Details Circle No. 415—Page 191

TWO-WHEELED BLENDER

Two-wheeled blender premixes bonding materials with shakeout sands before moisture additions. Thorough distribution of clay prior to distribution of moisture is said to promote more nearly uniform clay films on sand grains. It also is recommended to obtain random distribution of grain sizes when grain-size segregation is a problem.

No elevator feed is required, and the unit is mounted on a conveyor belt without alterations. It can be placed in position and made ready for operation in less than 25 man-hours. Units can be made for any



size or tonnage.—**Pekay Machine & Engineering Co.**, 865 N. Sangamon St., Chicago 22, Ill.

For More Details Circle No. 416—Page 191

VACUUM CLEANER

Industrial vacuum cleaner picks up 55 gal or ¾ bu of wet or dry material before emptying is required. Power head adapter converts any 30 or 55 gal drum to a high-powered suction machine for pick-up of oils, dust, water, shavings, and metal or wood chips. Moisture-proof, dustproof motor and a three-stage fan combine in a sealed vacuum system to develop a 78-in. water lift. Hoses and fittings are available with either a 1½ or 2 in. orifice. An automatic shutoff prevents accidental overflow of liquids.—Made by **Advance Floor Machine Co.**, 4100 Washington Ave. North, Minneapolis 12, Minn.

For More Details Circle No. 417—Page 191

FULL-FACE MASK

No. 1750 full-face, lightweight gas mask provides protection to eyes, face, and lungs. A single canister threads directly into the facepiece.

The mask is designed to eliminate buildup of CO_2 in the facepiece and to prevent fogging of lenses. Each canister is packed individually in a moistureproof tube. The complete mask is packaged in an individual carrying and storage case.—**Pulmosan Safety Equipment Corp.**, 644 Pacific St., Brooklyn 17, N. Y.

For More Details Circle No. 418—Page 191

Barrel System Vibrates and Rotates Parts

Barrel finishing system is said to cut time cycles up to 70 per cent and to permit barrel finishing of inside diameters. Based on a machine called the Vibraslide, the system combines principles of rotation and vibration to produce extremely rapid results during cutdown cycles. It also is capable of using either principle alone.

In addition to its fast finishing time, the machine is said to be able to handle up to three times as many parts. The frame is 67½ x 50 in. x 8 ft. The entire "power pack"—two motors and the vibrating mechanism—can be slipped out from the back of the frame for maintenance. Other barrel components are standard. The entire mechanism is rubber-mounted. It is claimed that the vibrating barrel permits barrel finishing of parts which previously had to be finished by slower, less economical methods.—Distributed by **Minnesota Mining & Mfg. Co.**, 900 Bush St., St. Paul 6, Minn.

For More Details Circle No. 434—Page 191

BENCH-TYPE FURNACES

Four models of utility-size electric bench-type furnaces have the same chamber dimensions, case size, and general construction, but differ in voltage requirements (115 and 230 v) and in mode of temperature control. They are intended for such uses as laboratory testing and experimentation and for process control and small-unit heat treating in the plant. Two models have a built-in controller which provides completely variable control of furnace temperature. The other two

ACME RESIN

NO PEEL BACK!

. . . When you use Sand Coated with Hot or Cold Process Acme Shell Molding and Core-Making Resins.

New Acme Resins may be worked on all types of Mullers, hot or cold.

Acme Resins provide for a faster molding cycle both in investment and cure.

New Acme Resins are being successfully used on all types of Shell Cores and Shell Molds easier and faster.

Eliminate problems from "problem" Cores with ACME RESIN.

NO CAKING

with Acme's new Shell Molding and Core-Making Resins developed and engineered especially for the Shell Molding Industry . . . caking and clumping have been eliminated.

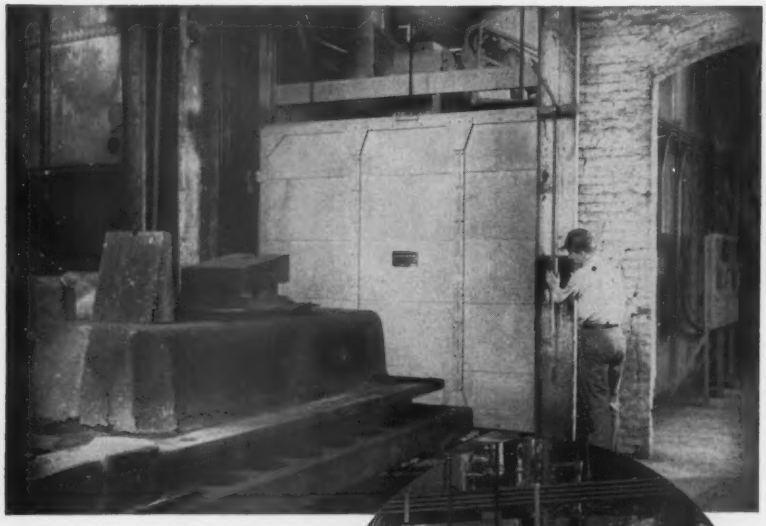
ACME RESIN CORPORATION

1401 CIRCLE AVENUE / FOREST PARK, ILLINOIS

(Suburb of Chicago, Illinois)

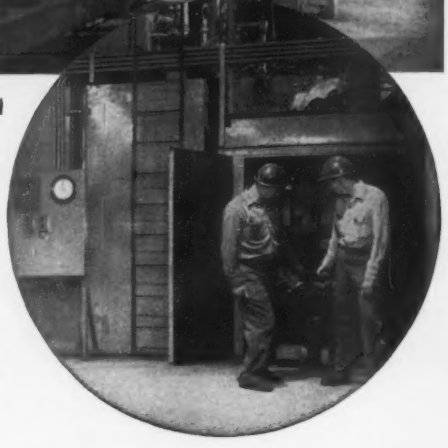
Circle 609 on Page 51

here's another
carl mayer installation...
Cutting Costs for its Owner



CAR TYPE CORE AND MOLD OVEN

Above—A difficult engineering and installation problem solved by Carl Mayer because the oven filled this space completely. This modern oven, with patented down draft heating system and motor operated lift door, replaced an obsolete brick oven.



RACK TYPE CORE OVEN

Right—Installed at rear of mold oven to form an efficient, flexible combination. Miscellaneous cores are uniformly baked with modern, automatic controls. Operation is efficient and economical.

Carl Mayer's outstanding engineering and design features sold the steel mill where these ovens are now in operation. They incorporate the exclusive Carl Mayer recirculating heating system and special triple slotted panel construction.

Heat loss is reduced up to 1/3, and fuel savings up to 50% over old conventional methods are possible. Temperature uniformity is guaranteed.

Consult Carl Mayer now for any type foundry oven or furnace, large or small, and for any purpose. Write for Bulletin 53-CM.

THE carl mayer CORP.

20800 CENTER RIDGE ROAD CLEVELAND 16, OHIO

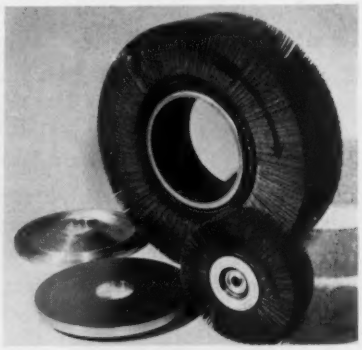
OTHER PRODUCTS Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories

incorporate five-position switches for off and for 500, 1000, 1250, and 1500° F temperatures. Temperatures to 1900° F can be obtained with a separate switch.—**Thermo Electric Mfg. Co.**, 465 Huff St., Dubuque, Iowa.

For More Details Circle No. 419—Page 191

COATED ABRASIVE WHEEL

Flap wheel polishes and finishes both contoured and flat metal surfaces. The wearable wheel is made up of hundreds of pieces of coated abrasive cloth with a stiffened construction which allows it to resist



pressure. This design is said to increase production rates and useful life. The wheel is particularly suited for use on full automatic polishing jack operations and also can be used on any standard bench grinder in place of a wire brush.

It is furnished with aluminum oxide or silicon carbide abrasive in a wide range of grit sizes, a variety of hole sizes, and in wheel sizes from 1 x 6 to 6 x 16 in. Wheels 10 in. or smaller are furnished with built-in disposable metal flanges. Reusable flanges are sold separately for use with the larger wheels.—**Behr-Manning Co.**, a division of Norton Co., Troy, N. Y.

For More Details Circle No. 420—Page 191

AC ARC WELDER

Arc welder of alternating current transformer type features diverter path control for adjustment of welding current. This control provides five steps of coarse adjustment with a rheostat for fine adjustment in each range. Extra secondary winding supplies current to the control rectifier, which is of standard selenium type. No high voltage appears across any control coils. This type of control eliminates the need for moving parts, and core and coils are anchored in place for quiet operation and less maintenance. Three

Silvery Pig Iron

SILVERY IRON GLOBE FERROALLOYS

Widely used in the production of gray iron, steel, and malleable castings and in open-hearth and electric steel making processes.

Produced in a blast furnace from an all-virgin ore burden, Globe Silvery contains little or no residual elements.

Globe piglets can be handled conveniently and economically.

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IRON ORE • PIG IRON
COAL • COKE • FERROALLOYS

Circle 645 on Page 51

models are available, rated at 300, 400, and 500 amp at 40 v ac, with welding ranges of 35 to 375, 35 to 500, and 35 to 625 amp.—**Hobart Bros. Co.**, Hobart Square, Troy, Ohio.

For More Details Circle No. 421—Page 191

SAND COATING RESINS

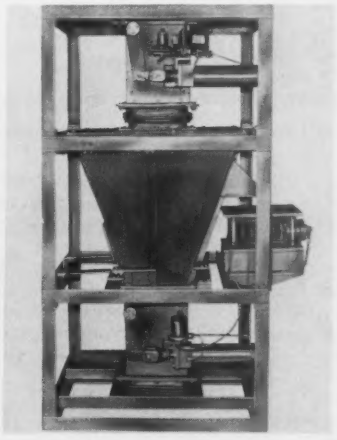
Two new liquid phenolic resins are available for coating sands used for production of shell molds and cores. Admirez LC-109 is used in cold coating sand for cores and contour molds which require medium curing speed, superior warp resistance, and high dimensional stability. It is said to impart high strength characteristics with excellent shakeout properties.

Admirez LC-200, for blown shell cores and contour shell molds, is designed for use in high-speed automatic mixing equipment. Reported advantages include low viscosity, fast curing, high dry strength, and excellent solvent release properties. —**Archer-Daniels-Midland Co., Federal Foundry Supply Div.**, 2191 West 110th St., Cleveland 2, Ohio.

For More Details Circle No. 422—Page 191

WEIGHING HOPPER SCALE

Unitized weighing hopper scale consists basically of three pre-engineered frames—feed, hopper, and



discharge—put together by building-block techniques to form the assembly. Feed and discharge frames can accommodate a selection of gate valves, slide gates, screw feeders, vibratory feeders, or similar units.

The hopper frame contains a flexure-mounted hopper which transmits a vertical force component to the pneumatic or electric weight transmitter. It is guaranteed accurate to within ±0.25 per cent of

Ferroalloys of Highest Purity

SILVERY IRON GLOBE FERROALLOYS

Ferrosilicons
High-Carbon Ferrochromes
Low-Carbon Ferrochromes
Low-Carbon Ferrochrome Silicons
Silicomanganese
Other Specialty Alloys

Produced in modern electric furnaces at Beverly and Jackson, Ohio, plants, from top quality raw materials, Globe ferroalloys are of highest purity and meet the most exacting requirements.

Shipments are by rail, water, or truck, in lump size or crushed.

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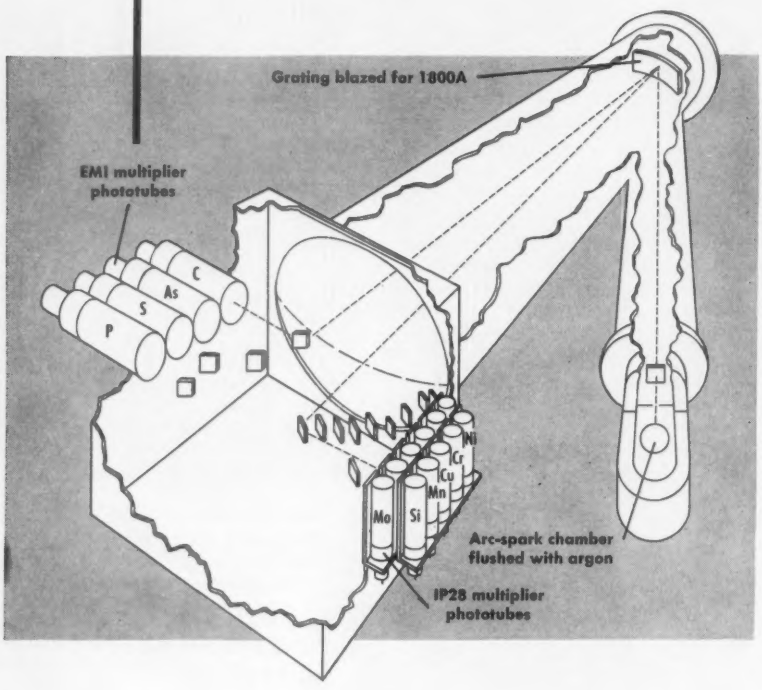
Circle 646 on Page 51

New Quantovac adds C, S, & P to metallic elements for complete high-speed analysis of steel & cast irons



ARL introduces the first large vacuum spectrometer to extend range of direct-reading spectrochemical analysis into far ultraviolet

The iron and steel industry has an important new high-speed analytical tool. For the first time, carbon, sulfur and phosphorus can be analyzed simultaneously with all the metallic elements in a few minutes. These nonmetallic elements no longer require expensive, separate analysis. Now, this one high-speed, direct-reading instrument will do the complete job.

By means of an evacuated spectrometer and argon-flushed arc-spark chamber, the Quantovac extends the spectrum range into the far ultraviolet. It thus provides the most sensitive arc lines of C, S, P, As, and Se for spectrochemical analyses, besides the usual lines of the metallic elements. In fact, as many as 24 elements may be analyzed simultaneously in the 1600-3300A range with the Quantovac.

The Quantovac will provide high-speed furnace control. It will save time and labor. Please write for full information. Your inquiry will be answered fully and promptly.

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Applied Research Laboratories
SPECTROCHEMICAL EQUIPMENT
3717 PARK PLACE • GLENDALE 8, CALIFORNIA
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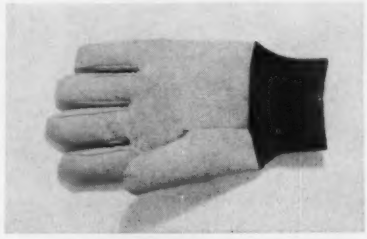
calibrated weight range. Standard hoppers have maximum capacities of from 5 to 90 cu ft. Weight information can be indicated, recorded, or totaled. It can be used for automatic batching, blending, inventory control, or other functions. Controls can be partly or fully automatic.—**Weighing & Control Components Inc.**, 448 Lincoln Ave., Hatboro, Pa.

For More Details Circle No. 423—Page 191

WORK GLOVE

Tiny nonskid plastic dots embedded in the fabric of work gloves provide a safety grip and long-wear-

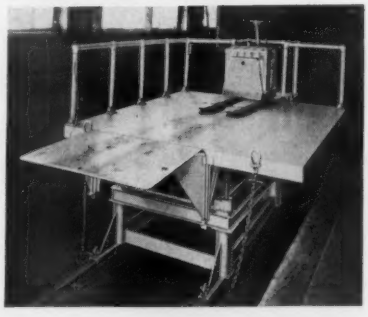


ing characteristics. Every square inch of the glove contains 300 dots, permanently molded into the cloth. Tear-resistant fabric used in the glove is light weight and flexible. As the fabric "breathes" between the dots, perspiration evaporates rapidly.—Made by **Riegel Textile Corp., Industrial Glove Division**, Conover, N. C.

For More Details Circle No. 424—Page 191

PORTABLE ELEVATOR

Portable elevator for use as a variable-height loading dock maintains constant level with truck beds. Be-



cause it can be positioned and removed from position by an overhead crane, a railroad siding also can be used for truck loading.

The platform is 12 x 12 ft exclusive of extensions. The latter form a bridge between platform and truck and a "pigeon hole" for a fork truck during delivery of materials by over-

Two Men Make 7-Million Cores a Year with Cities Service Core Oil!

Impossible? Not for the two core makers at Indiana Brass Company! Here's the story:

Recently, this firm, famous for its brass plumbing fixtures and fittings, determined to increase core production to meet rising product demand. First step was the installation of core blowers enabling sand to be blown directly into core boxes made to produce several cores at a time. Next, Indiana decided the cores should be baked in these same boxes.

Normally, this would require boxes with vents in the sides—an impossibility when you're blowing sand into them. But Indiana thought they could bake without vents, providing they could find the right core oil.

So, for six weeks, Indiana Brass tested one core oil after another. Only one proved successful... Cities Service Delco 64 ! Nowadays, with Cities Service Delco 64, Indiana uses its core blowers, then bakes directly in the core boxes, without air vents and without problems. Moreover, they've found Cities Service Delco 64 permits extremely fast baking. Thus, core boxes can rapidly be returned for use again and less boxes are needed.

If you want an oil to speed, simplify and reduce the cost of core production, talk with a Cities Service Lubrication Engineer. Or write: Cities Service Oil Co., 20 N. Wacker Drive, Chicago 6, Illinois.

READY ... SET ... POUR! In one week, Indiana Brass recently produced 121,147 castings! "Much credit goes to Cities Service Delco Core Oil," says Indiana. "It enables us to bake cores right in their boxes!"

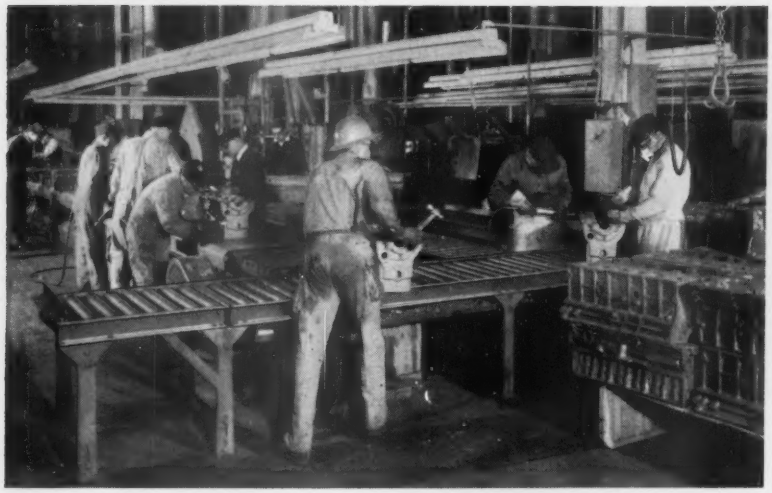
CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Circle 642 on Page 51

Ask Standard

how to cut costs with conveyors



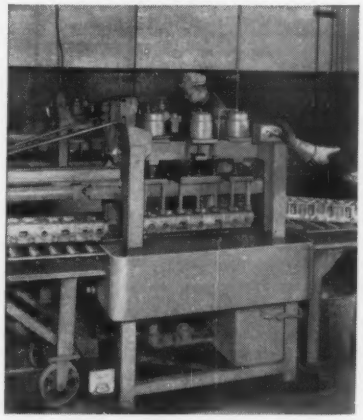
Cylinder blocks are chipped, ground and inspected on Standard Roller Conveyor line.

Eastern foundry simplifies cylinder block handling with roller conveyors

HERE'S another installation in which Standard Roller Conveyors are keeping heavy, bulky components flowing to machining and assembly points with minimum manpower and practically no time loss.

Easy to set up and exceptionally sturdy, Standard Roller Conveyors (live or gravity) can also be job-tailored to your specific materials handling problem — permanent or temporary.

And roller conveyors are only one of the many types of Standard conveyors. Others include belt, slat, chain, pushbar or sectional conveyors as well as spiral chute systems.



Standard Roller Conveyors are available from stock in a wide range of roller diameters, centers and frames.

Call the Standard engineer listed in your classified phone book or write direct for Bulletin 68 — Address Dept. N-4.

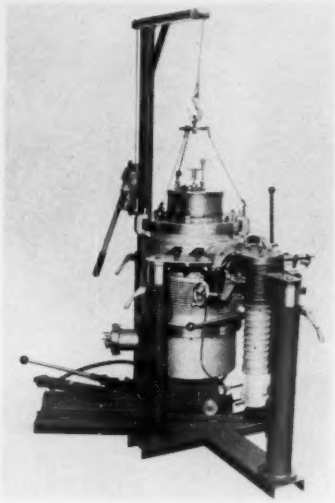
Why not take advantage of Standard's half-century of conveyor application experience. Consult STANDARD CONVEYOR COMPANY. General offices: North St. Paul 9, Minnesota. Sales and service in principal cities.

head crane. Load capacity is 10 tons. Lift is from 36½ to 59 in. at a speed of 13 ipm. Speed is controlled by a start-stop-inch button on a stanchion of the guard rail.— **Hamilton Tool Co.**, Ninth Street at Hanover, Hamilton, Ohio.

For More Details Circle No. 425—Page 191

SMALL VACUUM FURNACE

Laboratory vacuum furnace capable of attaining temperatures in excess of 2000° C has a capacity of 10 lb of steel or volume equivalent if the crucible is to be tilt poured and of 25 lb if bottom-plug pouring is used. It employs either resistance or induction heating and can handle either vacuum or inert gas melting and heat treating. Ceramic crucible and pouring spout are not cemented in place, permitting either to be replaced without chipping if it cracks or breaks.



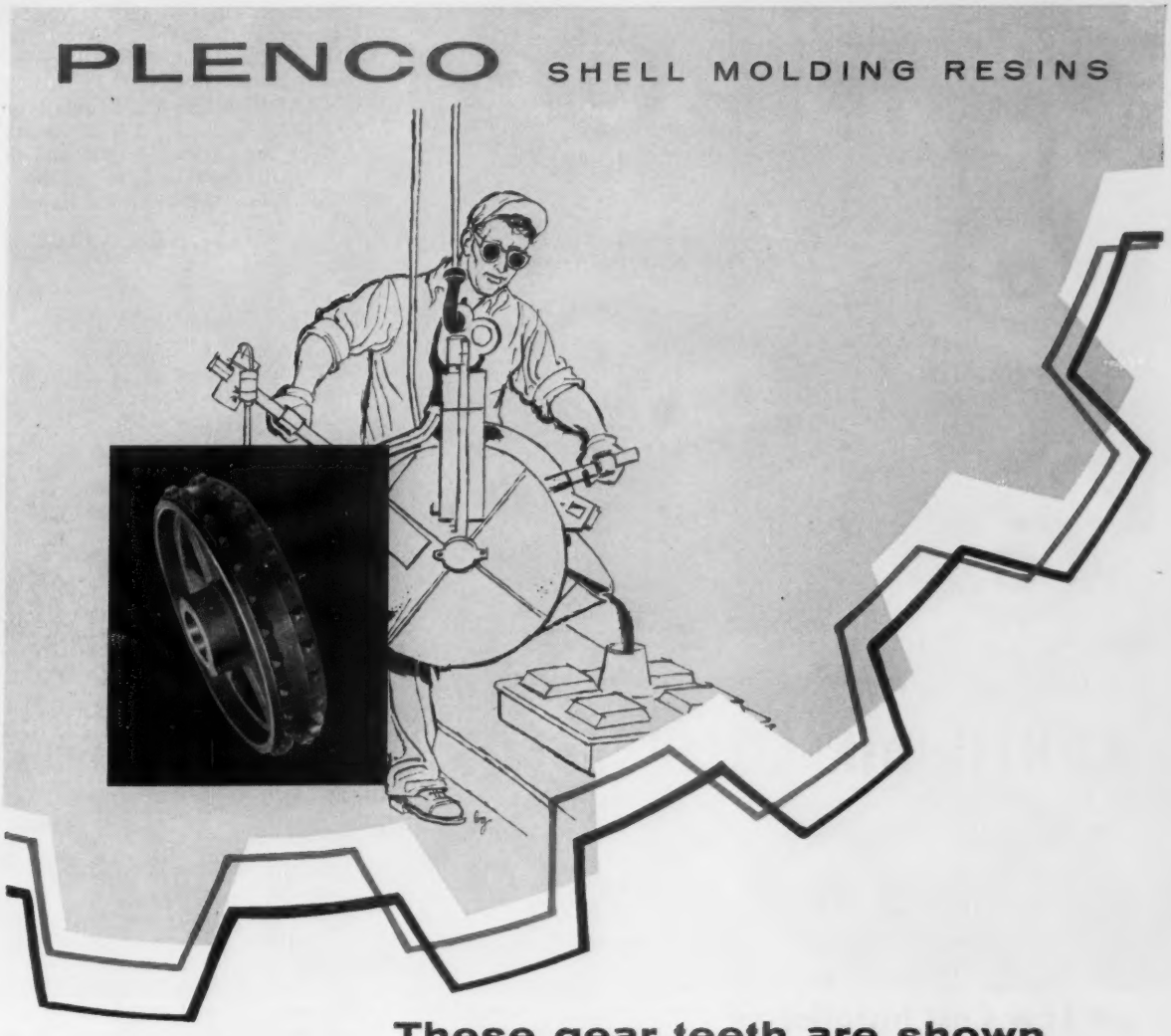
The pumping system of the F-9 furnace is claimed to reach pressures of 1×10^{-4} mm Hg in 18 minutes and an ultimate pressure of 3×10^{-5} mm Hg. The standard unit consists of a watercooled stainless steel vacuum chamber, a high-vacuum pumping system, and a separate controls and instrumentation box.— **Kinney Mfg. Div., New York Air Brake Co.**, 3529 Washington St., Boston 30, Mass.

For More Details Circle No. 426—Page 191

BANDSAW GUIDE WHEEL

Zefyr guide wheel for bandsaw guides features lifetime lubrication sealed in with a leakproof metal and teflon seal. Honed raceway and matched ball bearings minimize wear. The wheel accommodates speeds of 10,000 to 12,000 fpm and

PLENCO SHELL MOLDING RESINS



These gear teeth are shown exactly as they came out of the mold

Want to cast a gear with the teeth already on it? Shell molding is your answer. And Plenco shell molding resins help make this answer a good one.

Advantages? Many! For example, the teeth on the sprocket shown above required no machining, no finishing. And they possess above average tensile strength, because the shell molding process enabled the manufacturer to work with tough, ductile iron rather than malleable grey iron.

You can well imagine what shell molding can mean cost-wise. Savings on labor. Savings on material. Savings on time.

Many industrial companies are eagerly turning to shell molding and Plenco shell molding resins to help them achieve these substantially lower production costs.

Interested in applying these production economies to your product? Call on Plenco. We'll show you how.

PLENCO PHENOLICS
FOR BETTER PLASTIC PRODUCTS

PLASTICS ENGINEERING COMPANY

Sheboygan, Wisconsin

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

Circle 650 on Page 51

with the two-stage, air-cooled **up to 50 H.P.**

CURTIS AIR COMPRESSOR

● **Greater Efficiency**

The highly efficient C-100 air compressor delivers more air per minute, per horsepower and per kilowatt hour of electrical energy consumed, resulting in lower electric bills.

● **Low Cost Installation**

Since it is *air-cooled*, you are not faced with expensive plumbing installation costs. Water bills are eliminated entirely. Peak efficiency, together with low cost installation and minimum maintenance—all adds up to your best buy in air compressors today.

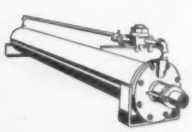
Remember, you can count on C-39

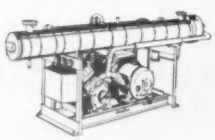
Curtis

OUR 104th YEAR

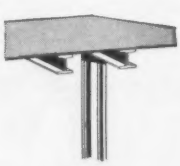
MANUFACTURING COMPANY • PNEUMATIC DIVISION

1922 Kienlen Avenue, St. Louis 20, Mo.


Air Cylinders


Packaged Liquid Chiller

Air Hoists


Lifting Platforms

is produced in two sizes. No. 20 corresponds to trade size No. 0 for 8000 to 10,000 fpm. No. 10 corresponds to trade size No. 1 for 10,000 to 12,000 fpm and will handle over 100 lb thrust load at 2500 hours average life. Both sizes are said to fit any standard bandsaw guide.—**Carter Products Co.**, Grand Rapids, Mich.

For More Details Circle No. 427—Page 191

ELECTRIC-POWERED TRUCKS

Company has added electric-powered units to its line of Clarklift fork trucks. A 2000-lb capacity model is in production, and additional models of heavier capacity are being scheduled. The electric trucks feature a "carbon pile" drive control which provides constantly smooth acceleration from a standstill to full

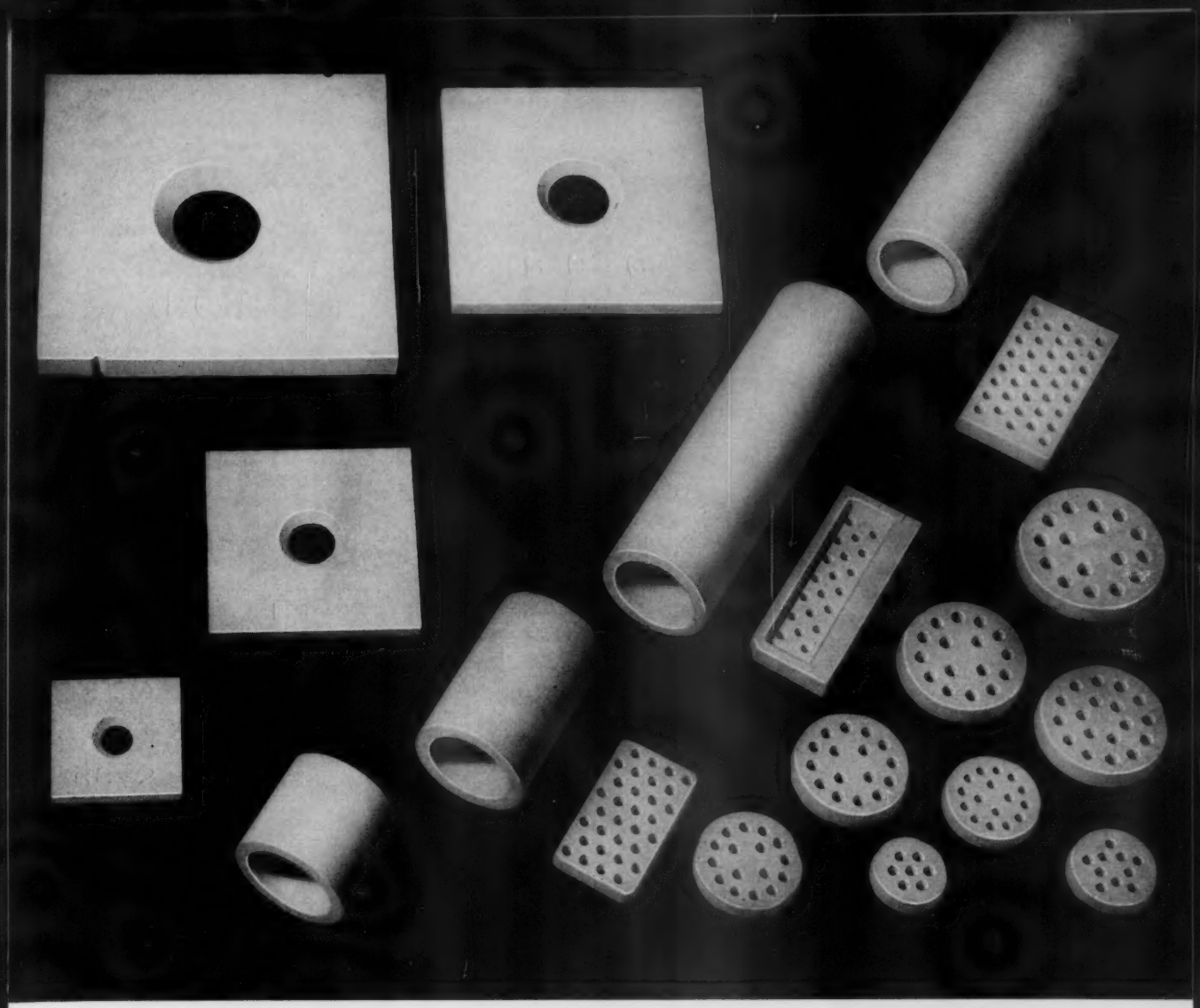
speed and permits full control of inching during stacking operations.

The 2000-lb model, the EC-20, will climb a 10 per cent grade with full load. It will travel up to 6.5 mph in forward or reverse and has a loaded lift speed of 50 fpm. This model is 67½ in. long and 34½ in. wide. Wheelbase is 44 in., and the turning radius is 62 in. Major components are interchangeable with those of gas-powered models of equal capacity.—**Industrial Truck Div., Clark Equipment Co.**, Battle Creek, Mich.

For More Details Circle No. 428—Page 191

ELECTROSTATIC COLLECTOR

New device is said to achieve complete control of the corona discharge on the energizing electrodes of electrostatic precipitators for dust collection, thus greatly increasing their efficiency. An electrode which resembles barbed wire is substituted for the conventional straight-wire energizer and prevents uneven accumulation of dust. The new wire is suspended vertically between collecting plates, and the barb points remain clean regardless of what insulating material builds up on the



what do you need in **gating** and **risering** refractories?

To our customers in the foundry field this ad will come as *welcome news.* Louthan's line of production-proved refractories has been expanded to cover still more of your needs—help you save time and money on still more of your jobs.

Louthan Strainer Cores are now available in more sizes and shapes—and for *steel, iron, brass* and *bronze* castings. All provide an accurate choke for positive control of metal flow, eliminate slag and oxide inclusions.

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So again we say, "What do *you* need?" *We have it!* If you haven't used Louthan Refractories, it will pay you to try them.

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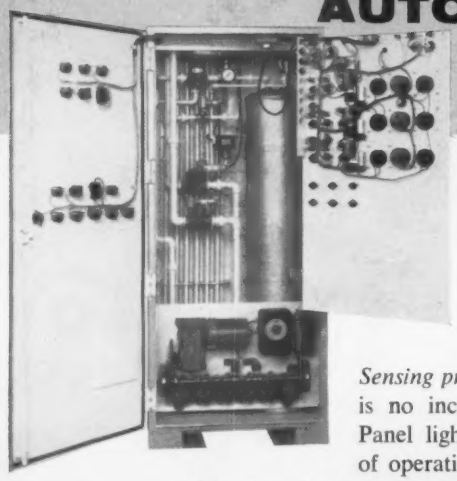
Circle 652 on Page 51

COMPLETE
Sand Mixing
AUTOMATION
IS
HERE



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Complete details sent upon request.

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Circle 653 on Page 51

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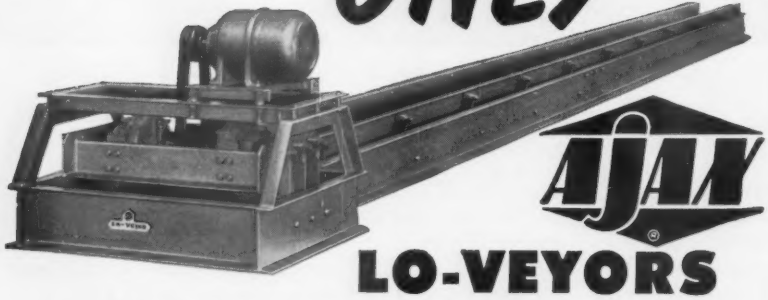

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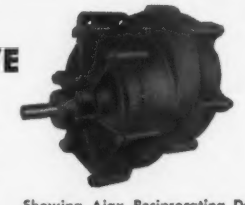


Showing Ajax Reciprocating Drive Unit. Smooth operation permits installation without heavy anchorage to building.

AJAX FLEXIBLE COUPLING CO. INC.
WESTFIELD, N. Y.

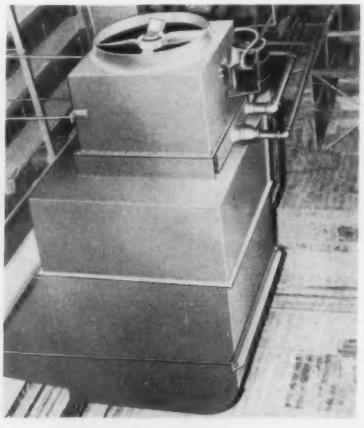
Circle 654 on Page 51

main wire. As a result, corona discharge occurs constantly at those points. Considerably greater power can be impressed on the new electrodes, and their efficiency is increased without other enlargement of the equipment. In new designs, smaller precipitators can handle given dust loadings and gas volumes. —**Metal Products Div., Koppers Co.**, 490 Scott St., Baltimore 3, Md.

For More Details Circle No. 429—Page 191

AIR MAKE-UP UNIT

Air make-up unit is designed to temper outside air and to supply it in sufficient quantities to eliminate negative pressures. It supplements a normal heating system by relieving the infiltration heat load. These



units are available in seven arrangements in six sizes from 24 to 54 in., with air capacities ranging from 4000 to 33,000 cfm. The basic unit consists of a fan and coil assembly, with the fan mounted in a plenum on the discharge side of the coil. With standard accessories, the unit can be used either as a unit heater or as a source of filtered air for ventilation.—**Aerovent Fan Co.**, Piqua 27, Ohio.

For More Details Circle No. 430—Page 191

STEEL COREBOX VENTS

Steel corebox vents are fabricated to order in two head depths, 0.030 and 0.050 in. Two designs are available. One features a recessed head and chamfered starting edge. The other is made with straight sides and a chamfered leading edge. These vents are for use in shell core production, which employs hot corebox and resin-coated sand.—**Andrea Mfg. Co.**, 180 N. Wacker Dr., Chicago, Ill.

For More Details Circle No. 431—Page 191

KNIGHT ENGINEERING EXPERIENCE CAN HELP

strengthen your profit position

The Knight organization with experience based on more than 400 successfully completed assignments in the foundry field has repeatedly assisted management to:

- MAINTAIN OR IMPROVE PROFITABILITY IN THE HIGHLY COMPETITIVE FOUNDRY INDUSTRY.
- MEET THE DEMAND FOR IMPROVED QUALITY AND PERFORMANCE OF CASTINGS
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It may be that you are paying for the modernization of your foundry without getting the benefit of more modern methods. Call or write Knight, without obligation, if you have a problem to discuss.

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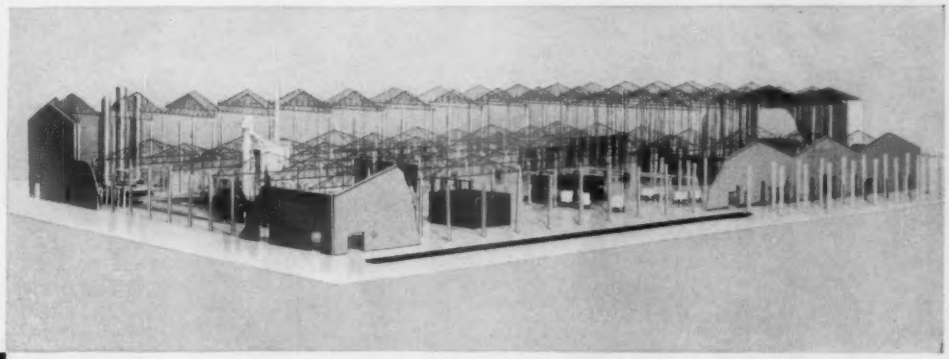
See this scale model of the newest and largest cylinder block, chilled iron wheel, agricultural implement, fittings and ingot molds and rolls foundry in Argentina at the Castings Convention and Foundry Show—Booth 2034.



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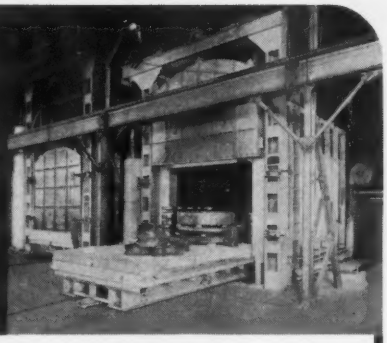

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Circle 656 on Page 51

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This Sterling Wheelbarrow has a reinforced tubular steel frame with special steel nose shoe. Provides perfect balance for forward end dumping and extra strength for heavy duty service. Rugged construction includes V-shaped tray braces and 12-spoked steel wheel. Ideal for wheeling sand, scrap, castings, coal and other heavy bulk materials. Can be furnished with pneumatic or zero pressure wheel. Prompt shipment.

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Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Concerning Olivine"

FOUNDRYMEN are striving more earnestly than ever to improve the quality of their product. This effort may be due partly to pride of performance and company reputation, but also to the demands of industry, which become more critical each day. Newer methods of casting production, to so-called precision standards, are being widely heralded, and the more orthodox but less expensive green sand practice is being reviewed and revised to conform more nearly to modern casting requirements.

In parts of the United States, especially on the West Coast, olivine sand is making a bid for recognition as a molding material of distinctive properties. A rather large deposit of this sand (or rock) is being processed in Washington, and its promoters are proclaiming its virtues and extending its use.

Not a Newcomer—Geologically speaking, olivine hardly can be considered new. It has been used effectively for many years in one or more Scandinavian countries, but only recently has attracted much attention from Americans. Due largely to the work of Professors Schaller and Snyder of Washington University, however, this sand now is being used both in experiments and production in a number of West Coast foundries, with promising results.

Technical papers giving preliminary coverage to the subject have been issued by the American Foundrymen's Society, and a number of articles concerning it have appeared in FOUNDRY. I am in no way qualified to question the findings of the experts on this subject or to delve into laboratory lingo. It is my purpose simply to report what I have seen and heard on the mold-

Actual photograph of a Cast Tooth Sprocket Gear in ASTM: A-148-53T Grade 90-60 Steel made in H-W Forsterite Grains shell mold by Fort Pitt Steel Division, Pittsburgh Steel Foundry Corporation.

SMOOTH CAST SURFACES result from resin-bonded shell molds of H-W FORSTERITE GRAINS

Forsterite grain is highly refractory magnesium silicate possessing physical properties which make it especially suited for resin-bonded shell molding. Its specific heat, thermal conductivity, high temperature stability and uniform thermal expansion —all contribute to its excellent performance.

As the result of the optimum chilling effect of forsterite grain, sufficient strength develops in the skin of the steel casting to resist outside gas pressure as well as inside ferrostatic pressure, and a smooth casting surface is assured.

H-W FORSTERITE GRAINS are supplied in controlled sizings best suited for securing the most satisfactory shell molded casting surfaces.

H-W FORSTERITE FLOUR is furnished for use as an additive to the H-W FORSTERITE GRAINS and resin mix to provide for the ultimate in surface smoothness, particularly of castings with heavy sections. Write for bulletin No. 6.

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Circle 611 on Page 51

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Large — Small
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WITH
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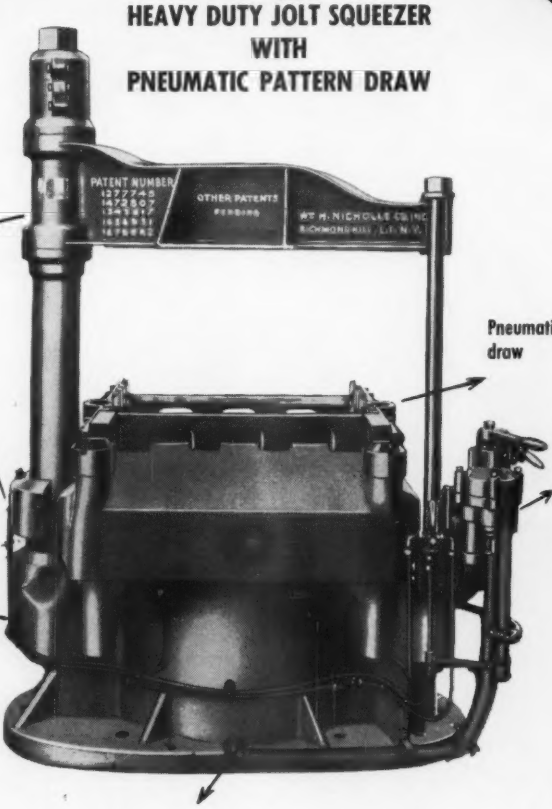

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Simple controls, push button or manual operation, automatic jolt and squeeze timing mean greater safety, shorter "break in" time, less manhours

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Circle 659 on Page 51

er's floor and in the foundry cleaning room and to express a few opinions for which I alone am responsible.

Beautiful castings in steel, gray iron, and the nonferrous metals have been cast in various grades of olivine sand. Whether it will prove economical to use this material as a system sand in general use is, however, a debatable question. I believe its greatest value presently is apparent in the molding of manganese steel. It currently is very costly—$45 to $65 per ton—and from my immediate viewpoint (gray iron) must be confined to special casting requirements.

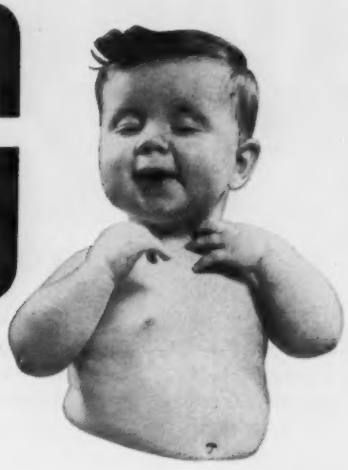
Grains of this sand are decidedly angular, even acicular, and its weight is close to 112 lb per cubic foot. Due largely, I believe, to this weight factor, it is extremely flowable. It produces firm mold walls and, at optimum moisture, deformation is desirably low. It is reported to have very low expansion, and my experience would support this contention. From day to day, even with nonuniform ramming, casting weights show a minimum of variation.

I do find, however, that the peel of olivine from gray iron castings leaves something to be desired. Even with a normal seacoal addition, a considerable amount of surface sand goes out with the casting. After milling or sandblasting, however, surface finish is excellent; in some instances, it closely approaches that of shell molded castings. In fact, olivine sand now is being used successfully in shell practice as a working mate of silica sand. It is said that this use has overcome some of the mold and core cracking problems in shell.

The Pattern Is Important—In any evaluation of casting surface, the primary determining factor is the condition of the pattern; grain size and shape of sand are secondary considerations. The finest and most flowable sand in the world will only accentuate pattern imperfections, not compensate for them. If we are to obtain a shell finish in green sand—and it can be done—we not only must have an adequate sand mix, but we also must have patterns as true and smooth as those demanded for shell. This point seems to be the stumbling block. The customer in many instances expects a casting finish superior to the finish of his patterns.

Olivine is said to have higher heat resistance than that of the best silica sand. I wouldn't know about that, for in iron it isn't necessary,

BRAG



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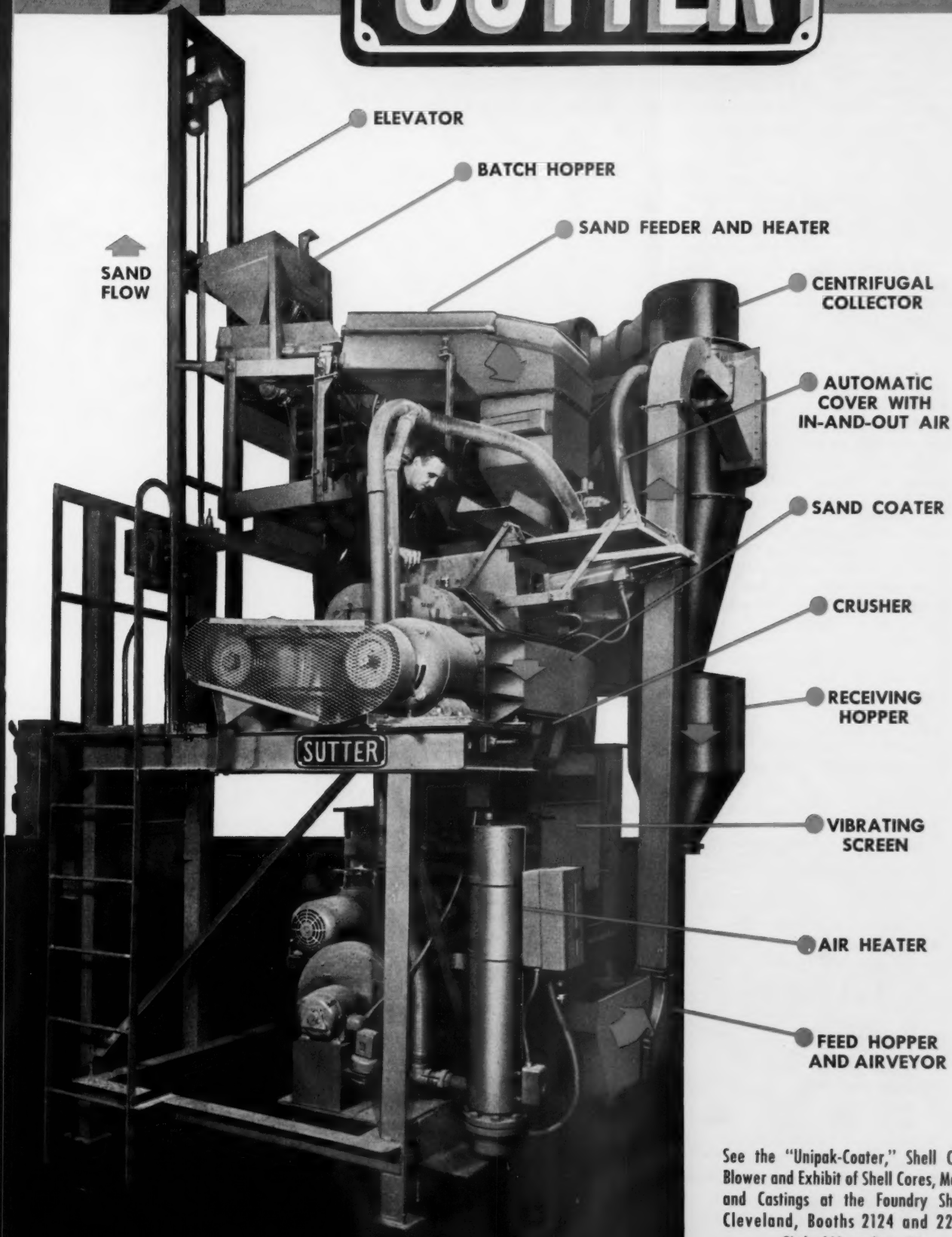


See the "Unipak-Coater," Shell Core Blower and Exhibit of Shell Cores, Molds and Castings at the Foundry Show, Cleveland, Booths 2124 and 2223.

Circle 661 on Page 51

but I do know that it produces a much more stable mold wall than the system sand I have been using, which weighs but 75 lb per cubic foot. I am inclined to believe that the added weight of olivine has much to do with its mold-wall stability.

Olivine not only is heavier than silica sand, and of a decidedly angular shape, but it is the only nonacid sand we ever have tested. It has a pH reading of 9.4. Loss on ignition registered 0.4 per cent. This latter mystifies me, for I had considered it a clay-free sand. It does, however, develop considerable green strength when mulled as a straight oil-sand core mix, even though this strength does not seem to retard flowability.

We recently cast a 4½-ton floor plate for a milling machine, using olivine sand cores for the bolt or T-slots. Except for the print section, these cores were surrounded by 1½ to 2 in. of metal. Since that metal was gray iron, it remained liquid for a considerable time. Although no core wash was used, the slots were remarkably smooth—in fact, the best we ever produced.

This core mix consisted of two grades of olivine sand—one-third No. 70 AFS fineness and two-thirds No. 130 fineness. We used 4 per cent core oil, which probably was at least 1 per cent too much, for the cores were exceptionally hard. Although no cereal was added to the mix, green strength registered over 1 lb. Whether this strength was due to the material registering as clay or to the peculiar shape and properties of the sand itself is a question for the boys in the laboratory.

New vs. Old Sand—We frequently resort to what might be called pilot experiments—that is, the mull-

"I appreciate the extraordinary care you take with the cores, Alex—but isn't your wife noticing the disappearance of her pillows?

What can happen in just three years when a foundry tries shell molding

How soon does shell molding begin to pay off?

The answer depends, of course, on many factors; but this report from Standard Brass Foundry Co., Cleveland, may help you set up some guideposts.

This 57-year-old firm started shell molding in a pilot plant in 1954. Today, after only three years' experience with shell, Standard Brass is successfully pouring a wide range of metals, including red brass and pure copper, in Durez-bonded shell molds.

75% less scrap

Using Durez foundry resins exclusively, Standard produces dense, nonporous castings that eliminate 75% of the scrap formerly experienced with green sand castings.

The absence of blow holes and internal voids in these castings means much more productive machining time for Standard's customers, and results in lower cost per finished piece.

Closer tolerances, clear, crisp threaded sections, cast-in slots, and other details impractical with sand castings are now routine procedures in this foundry's new, fast-growing shell department.

Standard finds a strong sales advantage in the *smooth surface* of castings poured in Durez-bonded shells. Most pieces require little or no cleanup before shipping.

"Put a shell casting up against a sand casting," says Standard Brass President Marvin Wolf, "and the appearance alone sells shell."

Sound, dense castings that need little or no cleanup are poured at Standard Brass Foundry Co. in these Durez-bonded shell molds.

As you can see, it doesn't take too much time to begin reaping the benefits of shell molding. More and more foundries are doing it every month.

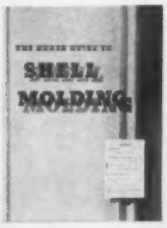
How to get started

Your Durez technical man can help *you* plan and carry out a conversion program. He's foundry-trained; backed by 35 years of resin experience and research. Call him in soon.

In the meantime, stay on top of newest shell molding developments by reading fact-filled "Durez Shell Molding News," published bimonthly. Write for it now—and let us know who else in your company should be receiving it.

NEW Durez Guide to Shell Molding!

Just off the press—second edition of this authoritative text. Written by men who have devoted years to improving the techniques of producing quality castings at lowest cost. Completely revised—covers patterns, equipment, materials, mixes, temperatures, lubricants, molds, cores, many other aspects of shell molding. Write today for a **free** copy.



DUREZ® HOOKER CHEMICALS PLASTICS

PLASTICS DIVISION

HOOKER ELECTROCHEMICAL COMPANY

1004 Walck Road, North Tonawanda, N. Y.

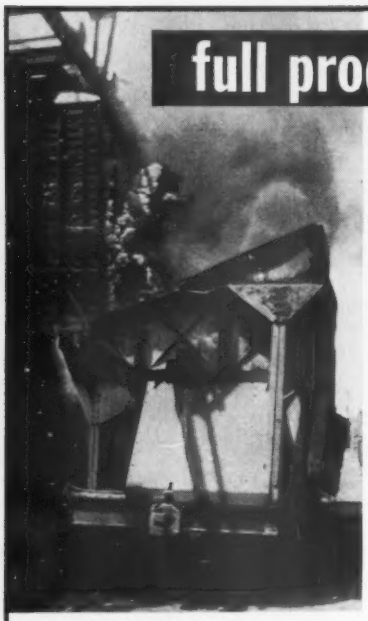
ing of a small amount of new sand with a prescribed ratio of additives —in an attempt to determine the behavior of a mix for a special casting. The result may be gratifying or disappointing, but in either instance it usually is misleading. Until sand is matured in use, it does not represent what we consider a production mix in green sand practice. Shell, plaster, and core must be considered new and expendable material, which is another story.

We are talking about green sand. Despite some specious arguments to the contrary, my conviction is that such sand, properly reconditioned, is improved rather than injured through use. New molding sand and new shoes have this in common: They must be broken in.

After a series of satisfactory pilot experiments, we decided some time ago to devote one molding floor exclusively to olivine sand. Our first mulled batches were, of course, with all-new sand—half AFS 70 fineness and half 130 fineness. To this was added 4 per cent southern bentonite, 3 per cent fire clay, 5 per cent seacoal, 1 per cent woodflour, and 3.8 per cent water.

In reconditioning this sand after each heat, we progressively reduced all additives except water. After the fifth mulling, a brittle condition developed which caused drops, stickdowns, and some sand wash. Accordingly, we eliminated the fire clay and southern bentonite and substituted straight western bentonite, with results that were immediately beneficial. In three or four days, however, the molder complained of a "balling" condition and a toughness that prevented flowability. Casting finish clearly reflected an unflowable sand. We then returned to straight southern bentonite and additional woodflour and slightly reduced moisture for three days. At that time, all "balling" disappeared, and the desired sand feel and casting finish were restored. Moisture then was reduced to 3.4 per cent.

Being reasonably sure that continued use of straight southern bentonite again would develop brittleness and its attendant evils, we decided to follow a pattern long established in our general green sand practice—that is, to blend the two bentonites in varying proportions as dictated by daily requirements. In this way we were able to detect deviations before they could develop into real scrap producers. If flowability began to suffer, we increased our ratio of southern bentonite and woodflour. If the ap-



full production ahead

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TERRE HAUTE SPECIAL FOUNDRY COKE

This top-rated foundry coke is now coming out of completely relined ovens—with their assurance of more decades of a sure supply.

Expect the high carbon, the low reactivity and ash you want. Cleanly sized over modern vibrating screens. Has ability to maintain optimum operating bed height in the cupola—and full melting efficiency. Ask for current analysis.

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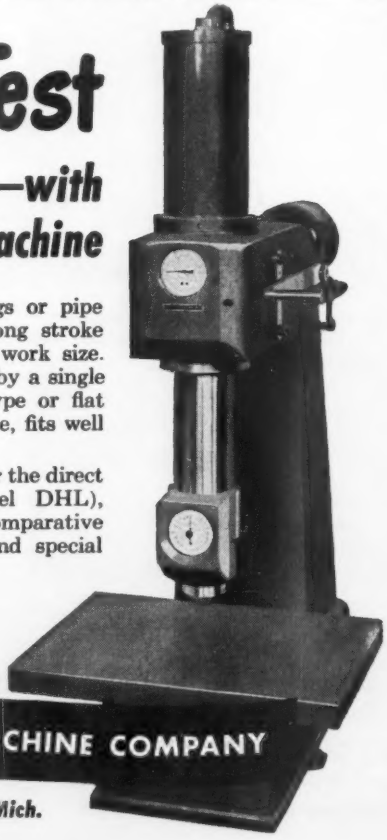
Circle 663 on Page 51

Brinell Test

large pieces fast—with this long stroke machine

Large awkward castings, forgings or pipe are easily tested because the long stroke eliminates screw adjustment to work size. The hydraulic ram is controlled by a single lever. Large, stationary roller-type or flat table makes work handling simple, fits well into a conveyor line.

Choice of plain Brinell machine or the direct reading machine (shown, model DHL), where dial at end of ram gives comparative hardness immediately. Larger and special machines may also be had.



Write for more information on all our Brinell testing machines.

DETROIT TESTING MACHINE COMPANY

9382 Grinnell Ave., Detroit 13, Mich.

Circle 664 on Page 51

proach of brittleness was indicated, these materials were reduced.

We purposely selected a loose-pattern jobbing floor for our olivine experiments. Molds were rammed with a jolt machine and a pneumatic hand rammer. There was little consistency in mold hardness from day to day, or even from mold to mold. Despite this laxity or variation in ramming, castings poured in olivine sand were remarkably uniform in both weight and finish. Regardless of some statements to the contrary, however, we found that moisture control was fully as important with olivine as with silica sand and that all values were lost when moisture readings reached 4.5 per cent.

Results Are Promising—At this writing, from our brief experience with olivine sand, we believe that it possesses properties of unusual promise. It certainly cannot be considered foolproof, and it is deserving of special treatment at the hands of your muller man. Since it is a comparatively new molding material, we may have to revise our thinking and procedure if its potential values are to be realized.

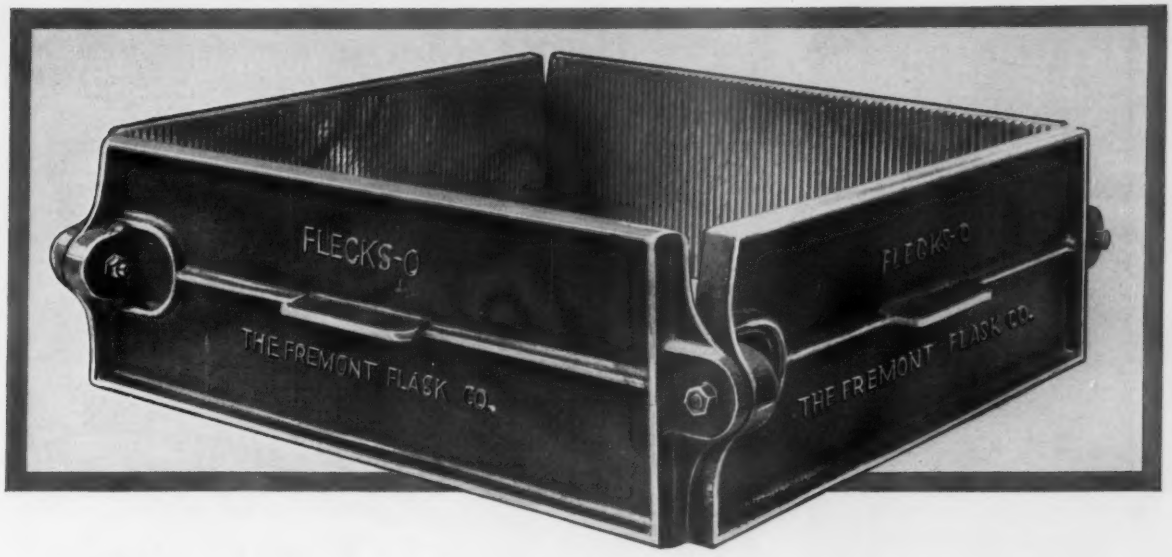
With the four grades of olivine now obtainable—namely, AFS finenesses 45, 70, 130, and 200—we have considerable latitude in blending. I wonder whether any attempt has been made to find a binder, other than the two bentonites and fire clay, which might prove more compatible with olivine sand? There might also be a wetting agent less explosive than water.

Royer Foundry & Machine Co. To Publish Series on Sand

W. P. Winter, assistant professor of industrial engineering (foundry), Pennsylvania State University, has been engaged by Royer Foundry & Machine Co., Kingston, Pa., to prepare a series of articles on practical sand conditioning which will appear in its bulletin, "Sand Conditioning Topics."

The series will include a discussion of physical properties of sands, effect of heat, sand conditioning, mulling, aeration and tempering, control tests, sand reclamation, storage problems, cores, and core sands. A refresher course in sand practice will be afforded for the foundryman and an introductory course for the unitiated.

The bulletin is distributed by Royer Foundry & Machine Co. to foundrymen throughout the U. S. and Canada on request.



Introducing Fremont's new

"FLECKS-O" Jacket

This new flexible JACKET has been developed to eliminate shifts and runouts.

The "FLECKS-O" will automatically line up with the sides of molds made in flasks assembled on any of the standard tapers. These JACKETS are available either in cast iron or cast aluminum.

The "FLECKS-O" is assembled from 4 castings, so if you have the misfortune to break one of them, you need not scrap the entire JACKET. Completely machined and drilled replacement castings can be furnished at a nominal cost. These can be installed simply by removing 2 nuts.

The FREMONT "FLECKS-O" JACKET will be displayed at the coming AFS Convention in Cleveland, May 12-16, Booth 612, Auditorium Exhibit Hall.

THE FREMONT FLASK CO.

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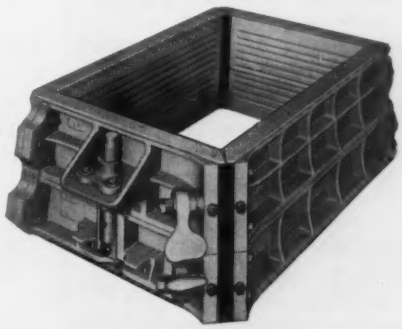
Fremont's

SPREADLOCK FLASKS

have tremendous corner strength. They are made of magnesium, with cams of hardened steel forgings. Accurately machined to assure exacting work. Look for the entire FREMONT line at the Foundry Show.



Circle 658 on Page 51

TAYLOR & BOGGIS
USES 18% LESS SAND
SAVES LABOR WITH...

Cleveland
FLAT COIL
CHAPLETS

Note clean chaplet breakoff on end bell hub which reduces cleaning operations.

Due to their low cost, Taylor & Boggis also uses flat coil chaplets for soldiers in deep green sand core pockets.

Only 1/2" to 1" of sand cover is required in the cope for firm support of these end bell core chaplets. Flasks are lighter and 18% less sand is handled on the end bell mold line.

In addition to providing positive core support, Cleveland Flat Coil Chaplets speed molding at Taylor & Boggis due to uniform stems and plating thickness. Check today for details on flat coil chaplet advantages in your molding lines.

Write today for *sample* and catalog!

Cleveland *Since 1890*
CHAPLET & MFG. CO.
26471 LAKELAND CLEVELAND 32, OHIO

Circle 666 on Page 51

Obituary

GEORGE F. PETTINOS SR., 95, president, George F. Pettinos Inc., Philadelphia, died Feb. 22. Born in San Francisco, he attended Dickinson College and was graduated from Lehigh University in 1887. He was associated with Bethlehem Steel Corp. for 5 years and in 1892 formed his own company in Bethlehem, Pa., importing and processing graphite. Later the business enlarged into the industrial sand and refractory cement fields and the business was moved to New York in 1915. Mr. Pettinos was one of the first members of the Philadelphia Foundrymen's Association and the American Foundrymen's Society.

Charles A. Breda, 79, until his retirement in 1949 general superintendent, Allyne-Ryan Foundry Co., Cleveland, died Feb. 16. Born in Germany, he went to Cleveland at the age of 12. Mr. Breda was with Allyne-Ryan Foundry for 40 years. Previously he was associated with City Foundry Co., Cleveland.

Joseph Nagusky, 86, former president, Federal Metal Co., Cleveland, died Feb. 9. Mr. Nagusky founded the company in 1913 and was its president for more than 40 years. He retired several years ago.

Emil Mares, 65, former owner of Star Pattern Shop, Cleveland, died Feb. 16 in Los Angeles, where he had made his home for the last 18 months.

Solomon E. Samuels, 62, metallurgist at Thompson Products Co., Cleveland for 19 years, died March 6.

W. J. Granville Sr., 66, retired district manager of Aluminum Co. of America's Bridgeport, Conn., plant, died Feb. 21.

George A. McGuire, 74, former superintendent of Bethlehem Steel Co.'s brass foundries in Elizabeth, N. J., and Staten Island, N. Y., died Feb. 26.

J. Reed Fidler, president and treasurer, Penn Iron Works Inc., Reading Pa., died Jan. 26.

Harry C. Huff, 69, sales engineer for Fulton Foundry & Machine Co., Cleveland, died March 3. Mr. Huff, who had been with the company for 35 years, handled the northeastern Ohio territory.

Stanley J. Sitarz, president-general manager, Prospect Foundry, Minneapolis, died Feb. 13.

E. R. Lamhofer, 50, purchasing agent, Erie Malleable Iron Co., Erie, Pa., died Feb. 20.

Describes Rational Approach To Air Pollution Legislation

Manufacturing Chemists' Association has published a second edition of "A Rational Approach to Air Pollution Legislation." Orginally issued in 1952, the booklet defines the precepts and principles essential to air pollution legislation and outlines procedures for formulating such laws. Rulemaking and enforcement also are discussed.

Emphasizing that controls should be in keeping with the regular democratic processes and that government functions must be preserved separately, the booklet also states that each local problem is unique and should be controlled by residents of individual communities. It suggests that the state be assigned the function of technical advisor and be juridisdictionally responsible after legislation has been initiated by local government.

Evaluation of Jobs in Small Industry Is Bulletin Topic

"Job Evaluation in Small Industry" is the subject of No. 89 in the Small Business Administration's series *Management Aids for Small Manufacturers.*

The publication points out that well run small plants try to relate their pay scales to work done rather than to people. Job evaluation is the technique used for measuring the comparative worth of different jobs. Writer of this bulletin is Robert H. Laws, Commonwealth Services Inc., New York.

Copies are available free from the SBA, Washington 25, D. C., or from SBA field offices.

Steel plant reports on use of B&W Kaocrete-32 in critical sections of electric furnace roofs:

•36% saving in installation time

•42% increase in roof life

•20% reduction in refractory costs

For further information on how you can profit with B&W Kaocrete-32 in electric furnace roofs, consult your B&W refractories representative or send for technical bulletin RR-46.

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Circle 667 on Page 51

Literature for Foundrymen

Belt Grinding Wheels

Plain or serrated rubber contact wheels for belt grinding are designated as model R57 and are 40 to 50 per cent cheaper than other models made by the company because of new manufacturing methods and techniques. A folder describes these new 14-in. wheels.—**Chicago Rubber Co.**, 651 Market St., Waukegan, Ill.

For More Details Circle No. 466—Page 191

Face and Eye Protection

Face and eye protection equipment, including goggles, glasses, lenses, welding helmets, hand and

face shields, and respirators is described in Catalog 35.—**Sellstrom Mfg. Co.**, Palatine, Ill.

For More Details Circle No. 467—Page 191

Sand Preparation Machinery

Bulletin 1230 illustrates and describes a complete line of sand preparation equipment for foundries of all sizes.—**Beardsley & Piper, Division of Pettibone Mulliken Corp.**, 2424 North Cicero Ave., Chicago 39, Ill.

For More Details Circle No. 468—Page 191

Tractor-Shovels

Tractor-shovels in capacities from 1 to 2¼ cu yd and attachments for these units are described in Folder 320.—**Frank G. Hough Co.**, 703 Sunnyside Ave., Libertyville, Ill.

For More Details Circle No. 469—Page 191

New Motor Frame Sizes

Bulletin B-1284-1 gives dimensions of the company's alternating current motors in new NEMA frame sizes from 364U to 445U and explains how to compare dimensions of Reliance Series C motors with those of the new frame size Series D line.—**Reliance Electric & Engineering Co.**, 24701 Euclid Ave., Cleveland 17, Ohio.

For More Details Circle No. 470—Page 191

Wire Rope Care

Major causes of wire rope crushing, including overloading, quick starts, wrong sheave sizes, and actual mechanical crushing, are discussed in Service Bulletin 102. Suggestions are given for recognizing and reducing these sources of trouble.—**Leschen Wire Rope Division, H. K. Porter Co.**, 2727 Hamilton Ave., St. Louis 12, Mo.

For More Details Circle No. 471—Page 191

Electric Hoists

Lug suspension, plain trolley, geared trolley, 4-wheel, motor-driven trolley, variable-speed motor-driven trolley, and close-headroom electric hoists with lifting capacities of ½ to 10 tons are covered in Bulletin E-58.—**Wright Hoist Division, American Chain & Cable Co.**, York, Pa.

For More Details Circle No. 472—Page 191

Mercury Lamps

Publication LS-103, covering color-improved, white, and semireflector mercury lamps, provides information on design and operating characteristics as well as physical, electrical, and output data.—**General Electric Co.**, Nela Park, Cleveland 12, Ohio.

For More Details Circle No. 473—Page 191

Aluminum Alloy

Folder describes aluminum-magnesium base alloy 417 which is said to have good mechanical and design properties and high corrosion resistance. — **Apex Smelting Co.**, 2537 West Taylor St., Chicago 12, Ill.

For More Details Circle No. 474—Page 191

Ventilating Fans

Ventilating units with forward curve wheels or backward blade nonoverloading wheels are described in Bulletin UVS-104. Included are performance tables, engineering data, selection and installation information, and specifications on 12 basic size package ventilating fans. —**General Blower Co.**, Morton Grove, Ill.

For More Details Circle No. 475—Page 191

Melting Furnaces

Bulletin 900 describes company furnaces, including those for melting iron and brass and combination melting and holding furnaces for aluminum. — **Stroman Furnace & Engineering Co.**, 9900 Franklin Ave., Franklin Park, Ill.

For More Details Circle No. 476—Page 191

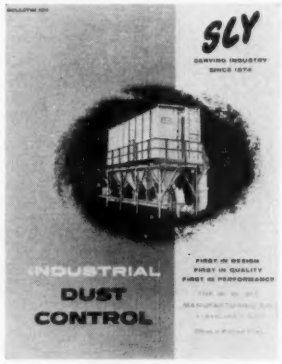
V-Belt

A new Condor LS V-belt made for long-center, heavy-duty drives is described in Bulletin M210.—**Raybestos-Manhattan Inc., Manhattan Rubber Division**, Passaic, N. J.

For More Details Circle No. 477—Page 191

Dust Control

Bulletin 104 describes complete line of company dust filters and gives detailed information about



dust control systems and how to engineer them. A discussion of operating principles of the Dynaclone dust filter is included.—**W. W. Sly Mfg. Co.**, 4650 Train Ave., Cleveland 1, Ohio.

For More Details Circle No. 478—Page 191

Weight and Load Measurement

Bulletin M-15 describes industrial weighing, load measurement, and recording instruments. Included are crane scales, lift truck weight indicators, tension and compression

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402	422	442	462	482	502
403	423	443	463	483	503
404	424	444	464	484	504
405	425	445	465	485	505
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load cell systems, crane weight indicators, dynamometers, and tensiometers. — **Martin-Decker Corp.**, Long Beach 7, Calif.

For More Details Circle No. 479—Page 191

Protective Coating

Catalog 257 features color chips of 102 protective and heat-resistant coatings. Catalog sections cover methods of surface preparation, use of primers and finish coatings, and the availability of special coatings where required. — **Rust - Oleum Corp.**, 2799 Oakton St., Evanston, Ill.

For More Details Circle No. 480—Page 191

Belt Conveyors

Belt conveyor manual 909 presents terminal selection tables, terminal dimensions, conveyor selection, belt selection, conveyor engineering data, and typical applications.—**Jeffrey Mfg. Co.**, 907 North Fourth St., Columbus 16, Ohio.

For More Details Circle No. 481—Page 191

Fire Protection

Brochure, "Fire Protection Service Plan," tells how a company can do a complete job of protecting itself against damaging fire loss through fire-fighting training and fire-prevention planning. — **Ansul Chemical Co.**, Marinette, Wis.

For More Details Circle No. 482—Page 191

Blast Cleaning

Blast cleaning, finishing, and shot peening ideas using the airless abrasive blast method are given in a 28-page "Handbook of Blast Cleaning Ideas."—**Wheelabrator Corp.**, Mishawaka, Ind.

For More Details Circle No. 483—Page 191

Cut-off Machines

Cut-off machines described in Bulletin 575 are rated from 5 to 20 hp and are designed for use on almost any shape casting at practically any angle.—**Tabor Mfg. Co.**, Lansdale, Pa.

For More Details Circle No. 484—Page 191

Dial Scales

Catalog on dial scales gives dial graduations, capacity, platform dimensions, and other key facts.—**Howe Scale Co.**, Rutland, Vt.

For More Details Circle No. 485—Page 191

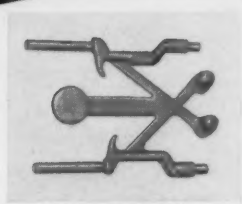
Hot Gas Washer

Single-unit hot gas washer which eliminates most air pollution problems and resists temperatures up to 2000°F is described in Bulletin L-2. The unit is designed to handle the

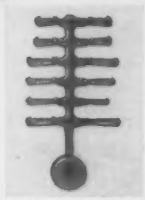
HOW ABOUT **DIE CASTING** YOUR PRODUCTS

...TO CUT COSTS?

ALUMINUM MAGNESIUM BRASS



Fishing rod handles and ferrules



Honing stone holders

Faucet spouts

Samples of the variety of parts that can be die-cast on the "American" at High Speed.

LOOK INTO THIS "NEW" MODEL 150A

AMERICAN DIE CASTING MACHINE TO INCREASE YOUR PROFITS.

It will pay for itself in 6 months.

SHIPPED COMPLETE—READY TO RUN. Big casting performance engineered into a LOW COST, HIGH SPEED unit. The only machine of its kind specifically designed as either a complete supplementary item for big shops or a production unit for small shops.

For accuracy, density of casting, superior finish, the "American" has a record of producing premium quality castings of any intricate design.

- **150 ton locking pressure.**
- **20" x 21" platens—solid steel toggles.**
- **Up to 350 shots per hour.**
- **Only nationally advertised components used.**
- **Lower operating cost.**
- **EASY TO BUY—financing up to 36 months at bank rates.**

FREE ENGINEERING SERVICE — We will help install your "AMERICAN"—train one of your men as an operator — start you producing high quality castings. **Write Today for bulletin.**

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1742 W. Winona St., Chicago 40, Ill. PHONE: LOngbeach 1-7118

exhaust from melting furnaces.—**Lehigh Fan & Blower Division, Fuller Co.**, Catasauqua, Pa.

For More Details Circle No. 486—Page 191

Conveyor Belts

Stitched canvas conveyor belts for general purpose conveying, carrying materials as hot as 600° F, for transporting oily and abrasive materials, and for live roller service are described in booklet.—**Main Belting Co.**, Middletown, Conn.

For More Details Circle No. 487—Page 191

Rubberized Abrasives

Catalog 228 describes rubberized abrasives for deburring, smoothing, and polishing.—**Cratex Mfg. Co.**, 1600 Rollins Rd., Burlingame, Calif.

For More Details Circle No. 488—Page 191

Corebox Vents

Three types of slotted brass corebox vents are described in folder.—**Andrea Mfg. Co.**, 180 North Wacker Drive, Chicago 6, Ill.

For More Details Circle No. 489—Page 191

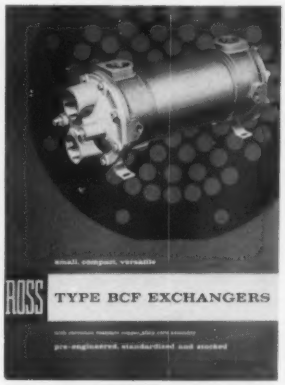
Refractory Mortars

Bulletin 600 presents installation photographs, product features, and technical data on the company's line of refractory mortars.—**J. H. France Refractories Co.**, 1944 France Rd., Snow Shoe, Pa.

For More Details Circle No. 490—Page 191

Heat Exchangers

Details of the recently expanded line, performance improvements, and design features of type BCF

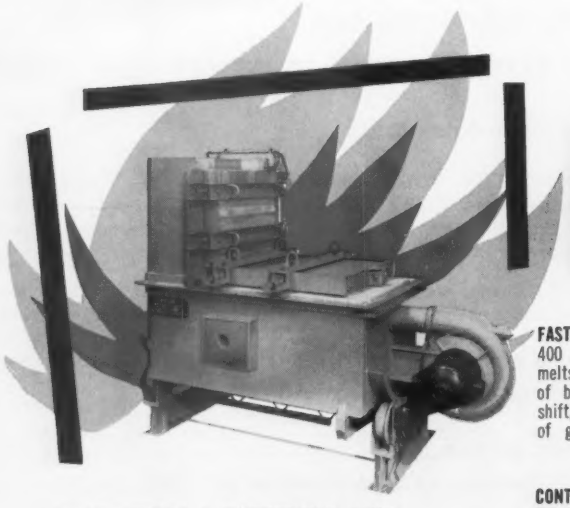


heat exchangers are set forth in Bulletin 1.1K6. Use on diecasting machines is included among the applications for these exchangers.—**Ross Heat Exchanger Division, American-Standard**, Buffalo 5, N. Y.

For More Details Circle No. 491—Page 191

SAVE $ WITH REDA FURNACES

FUEL SAVINGS UP TO 50% REPORTED
USING REDA GAS-OIL FIRED FURNACES!



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FASTER MELTING — One 400 series Reda Furnace melts up to 11,000 lbs. of brass or bronze per shift, and up to 6,000 lbs. of gray iron per shift.

LOWER MELTING & MAINTENANCE COSTS— One man can operate a Reda Furnace . . . No daily repairs needed!

CONTINUOUS POURING— No waiting until floors, flasks, boards, etc. are filled with molds!

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REDA PUMP COMPANY - BARTLESVILLE, OKLAHOMA

Hand Trucks

Bulletin T-1-A gives construction features, applications, and basic specifications for steel-framed two wheel and platform hand trucks, and wood and malleable iron dollies.—**Fairbanks Co.**, 393 Lafayette St., New York 3, N. Y.

For More Details Circle No. 492—Page 191

Die Heaters

Booklet gives assembly and operating instructions plus a parts list for die heaters made with infra-red generators for casting machines.—**Perfection Industries**, 1135 Ivanhoe Rd., Cleveland 10, Ohio.

For More Details Circle No. 493—Page 191

Vibratory Equipment

Condensed Catalog 5712 illustrates, describes, and gives specifications on vibratory bulk materials handling equipment and other products.—**Syntron Co.**, 540 Lexington Ave., Homer City, Pa.

For More Details Circle No. 494—Page 191

Temperature Measurement

Catalog 175 presents descriptive and technical data on optical, micro-optical, radiation, immersion, surface, and indicating pyrometers.—**Pyrometer Instrument Co.**, Bergenfield, N. J.

For More Details Circle No. 495—Page 191

Cupola Flux

Fluorspar base, brick type cupola flux is described in information sheet along with suggestions on why and how to use the material—**Superflux Mfg. Co.**, Allen Park, Mich.

For More Details Circle No. 496—Page 191

Work Gloves

A full line of fabric work gloves coated with neoprene, vinyl plastic, or natural rubber is described in booklet.—**Granet Corp.**, Framingham, Mass.

For More Details Circle No. 497—Page 191

Pneumatic Tools

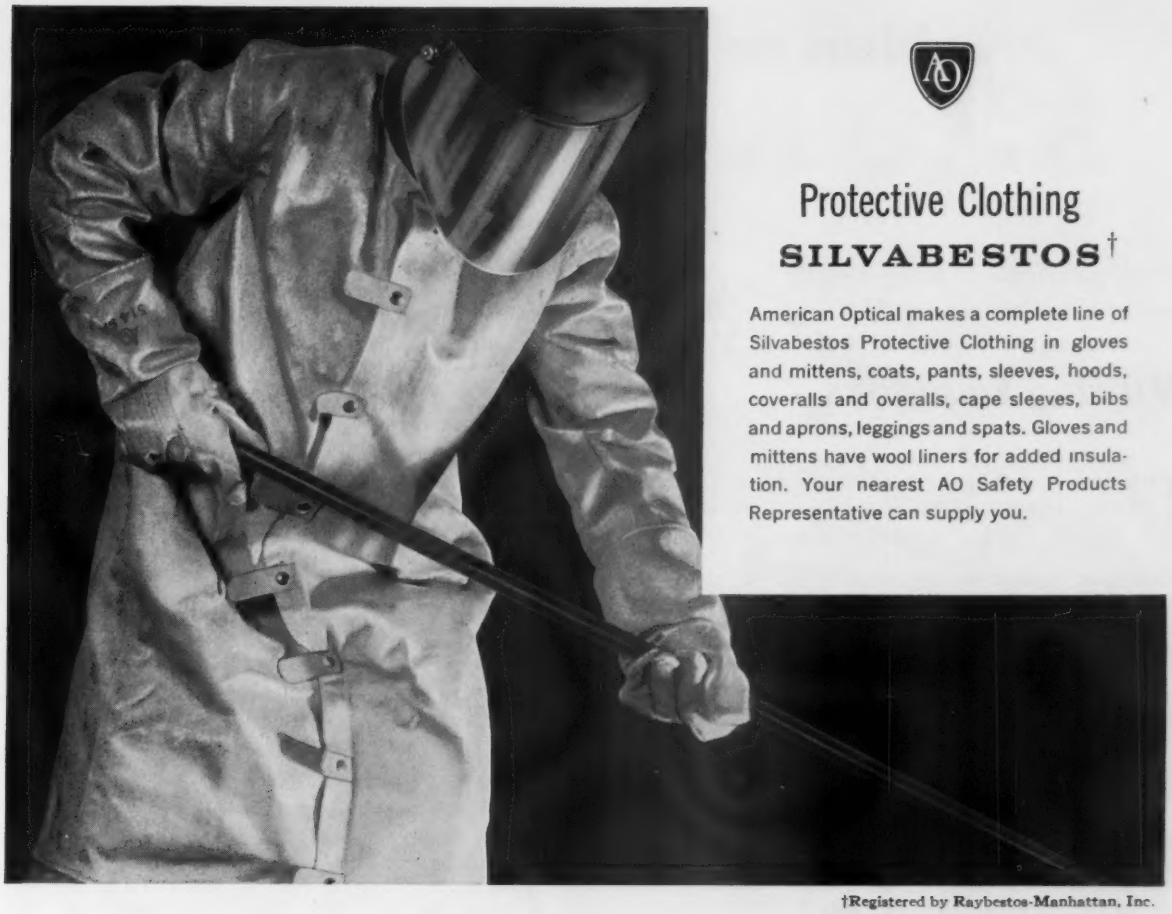
Pneumatic grinders, disc sanders, and hammers which also use chisels are covered in Bulletin F-14124.—**Skil Corp.**, 5033 Elston Ave., Chicago 30, Ill.

For More Details Circle No. 498—Page 191

Rotary Tools

Catalog 12 gives specifications on carbide rotary reamers, end mills, cutters, drills, files, and special tools.—**Dixie Tool Industries Inc.**, Bridgeport, Mich.

For More Details Circle No. 499—Page 191



Protective Clothing
SILVABESTOS†

American Optical makes a complete line of Silvabestos Protective Clothing in gloves and mittens, coats, pants, sleeves, hoods, coveralls and overalls, cape sleeves, bibs and aprons, leggings and spats. Gloves and mittens have wool liners for added insulation. Your nearest AO Safety Products Representative can supply you.

†Registered by Raybestos-Manhattan, Inc.

For Light Weight, Long Wear Protection . . .

AO SILVABESTOS† CLOTHING

Here's American Optical's new line of improved coated asbestos clothing which offers unusual abrasion resistance, lightweight, flexibility and comfort, and a heat reflection of about 40%. It is designed for operations where the high radiant heat reflectivity of our aluminized line is not required.

Abrasion tests of AO Silvabestos show increased wear resistance up to 168 per cent over conventional asbestos of heavier weight — an advantage of particular importance in gloves. What's more, Silvabestos clothing has superior tensile strength and stronger seams and does not readily absorb oil and grease.

Workers will appreciate the lighter weight of this clothing which minimizes fatigue and makes for greater efficiency on the job.

Recommended uses: Open hearth operations, heat treating, exposure to molten metal and similar exposures. (Should not be used in contact with open flame.)

Always insist on AO Trademarked Safety Products

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS
Branches in Principal Cities

1833-1958 • 125 LEADERSHIP YEARS

Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"Visiting foundries, I enjoy keeping my eyes open for the part that person-to-person relationships play in their successful operation"

Visiting Foundries

I'VE always had a weakness for visiting foundries, even as a kid. I couldn't go by the open door of one. I'd stand there for a while, then start to edge my way in a bit to see whether I'd be chased away or invited all the way in. I often was chased, but on the other hand I got into quite a few, tried to keep out of the way and out of danger, did a pretty thorough job of looking and seeing, and usually asked more questions than my hosts had time to answer.

I never have been able to break myself of this habit. Even today I get chased away over the 'phone while sparring around for an invitation to a strange foundry in some town where I'm going to make a speech. I guess some foundrymen can't understand why anyone in his right mind, with nothing to sell or buy, would want to visit a foundry, of all places. Some of these 'phone voices are grumpy, to say the least.

The Royal Welcome—This doesn't happen to me very often, however, for most foundrymen read FOUNDRY, and quite a few read my column, "Man to Man." I couldn't have been invited more cordially after a cold-turkey telephone solicitation than I was a short time ago by the folks at Enterprise Foundry in Oklahoma City. You'd have thought I was a long-lost uncle when I walked into the place. The "Hi, Docs" made me feel I was one of them in nothing flat.

I don't know when else I've run into such a wholesome, he-man-to-man atmosphere of friendliness, and I didn't have to look far for the reason. It was the head man, the owner, one of the best all-round foundrymen I've met in a long, long time. Through the grapevine I learned that when he first came to Oklahoma City, about all he had to his name was the clothes on his back and a slick in his hip pocket. You should see his place now.

Every one of the boys I talked to thinks he's tops—not that he doesn't tell 'em what is what when they know darned well it's coming to them. But, according to them, he respects everybody in the place who has proved himself, regardless of the job he holds. It sure was a treat to visit fellows who weren't carrying chips on their shoulders and bellyaching about everything under the sun.

A Temporary Job—From what I could gather, I don't believe there was one individual in the place who was hired as a journeyman molder. Waiting for his iron, one fellow said, "Doc, I never expected to be here six years. I just took what I thought was a temporary labor job to tide me over. One day the boss asked me if I'd like to learn to mold. 'Not particularly,' I answered.

Even as a boy, I couldn't go by the open door of a foundry

" 'In that case,' the boss said, 'come along with me.'

"He took me under his wing, showed me how to go about getting ready to make a mold, how to do it, didn't make fun of my bungling, and always popped up when I got in over my head. Well, here I am, handling just about everything that comes my way. Excuse me, Doc. I think I can get in there now."

The funny thing is, that just after I got back to the Lee Hobby Foundry, I read in *Steel* (that's our sister publication) quite an article on the scarcity of management material and the need for shifting promising talent about the place a bit to get the over-all picture. That's what Frank Hickman told me he did. (He's the head man—wouldn't stand Mr. from me.)

Another thing I found: Frank gives the boys their heads—that is, plenty of rope while still keeping an eye on them. "For instance," he said, "that fellow over there is the melter, in charge of the cupola. He keeps his own hours; goes and comes as he pleases. His job is to give us enough hot, good iron when we need it. He never has let us down, and we sure do pour one wide variety of sections and irons."

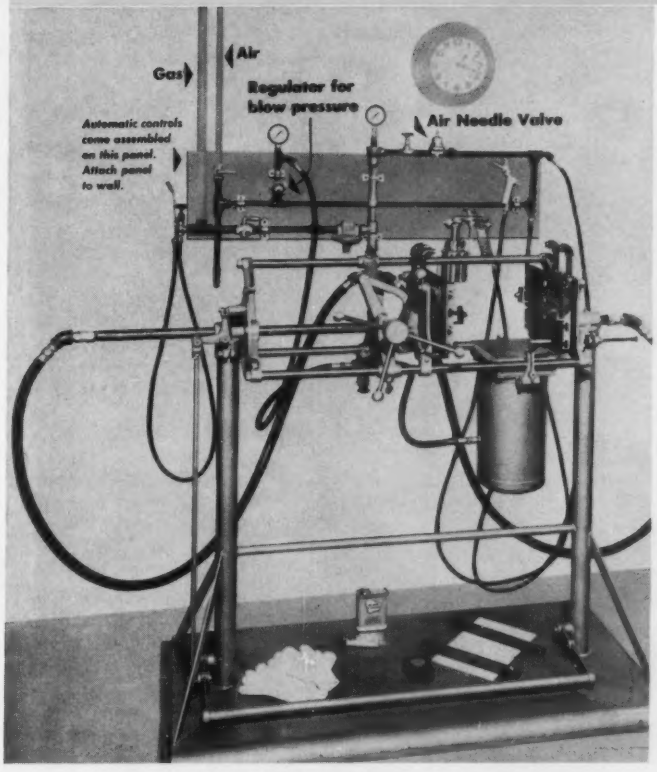
In the cleaning and shipping room, I found that Frank wasn't exaggerating a bit as to variety. They make ornamental filigreed balustrades, architectural decorations (sharp and clean, too), trivets, lawn furniture and ornaments, charcoal broilers, drain grates, manhole rings and lids, and a whole raft of industrial castings.

A Happy Medium—Another thing

'DEPENDABLE'

SHELL CORE MACHINE

LOW Initial Cost . . .
ECONOMICAL Production . . .
EASE of Operation . . .


Gas
Air
Regulator for blow pressure
Air Needle Valve
Automatic controls come assembled on this panel. Attach panel to wall.

Bring shell core molding within reach of every foundry.

Engineered with foundry "know how" — the DEPENDABLE Shell Core Machine produces shell cores known for: Unexcelled Permeability . . . Collapsibility . . . Accuracy . . . Easy Shake-Out . . . and are used, not only in shell molds, but also in the regular green sand foundry and in permanent molds.

DEPENDABLE is a rugged, precision machine — engineered to give years of trouble-free service. All working parts are high grade castings, accurately machined. Ball bearing rollers make for easy carriage operation. Bronze hex-head bushings permit accurate core box matching.

1. "Quick Change" for short runs.
2. Core boxes can be used with little or no alteration.
3. Produces intricate small cores in four gang boxes at the rate of ten per minute, and cores up to 9" diameters or 18" lengths at the rate of one per minute.
4. Low Fuel Cost—Either natural, manufactured or bottled gas can be used with heat applied directly to the core box.
5. Various thicknesses of core can be obtained by length of time invested.
6. Eliminates the need for driers or pasting.

Price **$1097,** F.O.B. Portland, Oregon
Shipping Weight, crated, 400 lbs.
Completely equipped with all valves and controls.
Easily installed.

Completely Equipped and Assembled

Your Dependable Shell Core Machine comes completely equipped and assembled ready to operate. All you do to install is hook up to gas and compressed air lines . . . and start making cores. There are no other purchases of accessories or installation labor expenses.

DEPENDABLE
PATTERN WORKS
1634 S.E. SEVENTH AVENUE
PORTLAND 14, OREGON

DEALERS:

Frederic B. Stevens, Inc.
Detroit 16, Michigan

Pennsylvania Foundry Supply & Sand Co.
Philadelphia 24, Pa.

M. A. Bell Co.
St. Louis 2, Mo.

Snyder Foundry Sup. Co.
Los Angeles 58, Calif.

Kramer Ind. Supply Co.
Denver 5, Colo.

Harold E. Pridmore
Los Altos, Calif.

Don Barnes, Ltd.
Hamilton, Ont.

Foundry Supply Co., Inc.
Minneapolis 14, Minn.

Frank H. Jefferson, Inc.
Seattle 4, Washington

W. O. McMahon
Birmingham 9, Ala.

LaGrande Ind. Supply Co.
Portland 1, Oregon

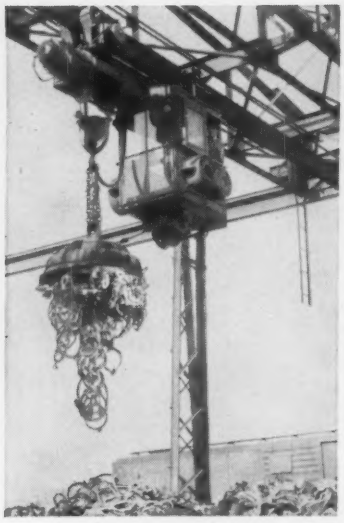
Circle 671 on Page 51

SHEPARD NILES
HOISTS

CUT HANDLING COSTS

in YOUR plant with the right hoist

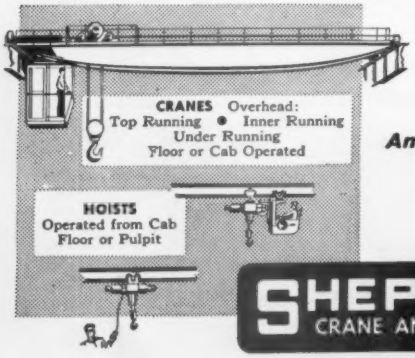
FLOOR-OPERATED HOIST
Operator primarily occupied with other duties, uses hoist for fast, efficient short hauls.



CAB-OPERATED HOIST
Cab operator moves loads at high speeds, can quickly spot material for handling.

WHICH Shepard Niles hoist fits your plant's needs . . . a floor-operated hoist where the operator is freed for other duties or a cab-operated hoist where the operator is engaged full time moving loads through the air? Shepard Niles manufactures both types in capacities from 1 to 20 tons.

Send for the descriptive bulletins on both Cab and Floor Operated Hoists . . . or ask that a Shepard Niles representative call — there's NO OBLIGATION.



Building
America's Most Complete Line of Cranes and Hoists Since 1903

SHEPARD NILES
CRANE AND HOIST CORPORATION
1395 Schuyler Ave., Montour Falls, N. Y.

that impressed me was the sort of a happy medium between going hogwild on mechanization and doing it the hard way. They had no mold conveyors, but they did have some overhead conveyors for toting ladles and for pouring. They didn't have a sand system, but they did have one of those powered sand-cutters. Shot blast helped them with their cleaning, but they didn't have one piece of sand testing equipment. The eagle eyes of the boss and the melter served as pyrometers and for checking fractures. But darn it all, the castings going out of that shipping room were good.

I didn't mean to get into the statistical, mechanical, or layout side of Enterprise Foundry's operation—just the man-to-man side. In fact, I have no moral to draw from my splendid visit there unless it might be the fun of visiting foundries with an eye open for the part person-to-person relationships can play in the successful operation of a foundry.

When I checked this article with John Linabury, retired foundry consultant for General Motors, as I do all my articles, he asked me, "But are they making any money?" I told him that I didn't see their statement, but they all seemed to be living pretty well up on the hog.

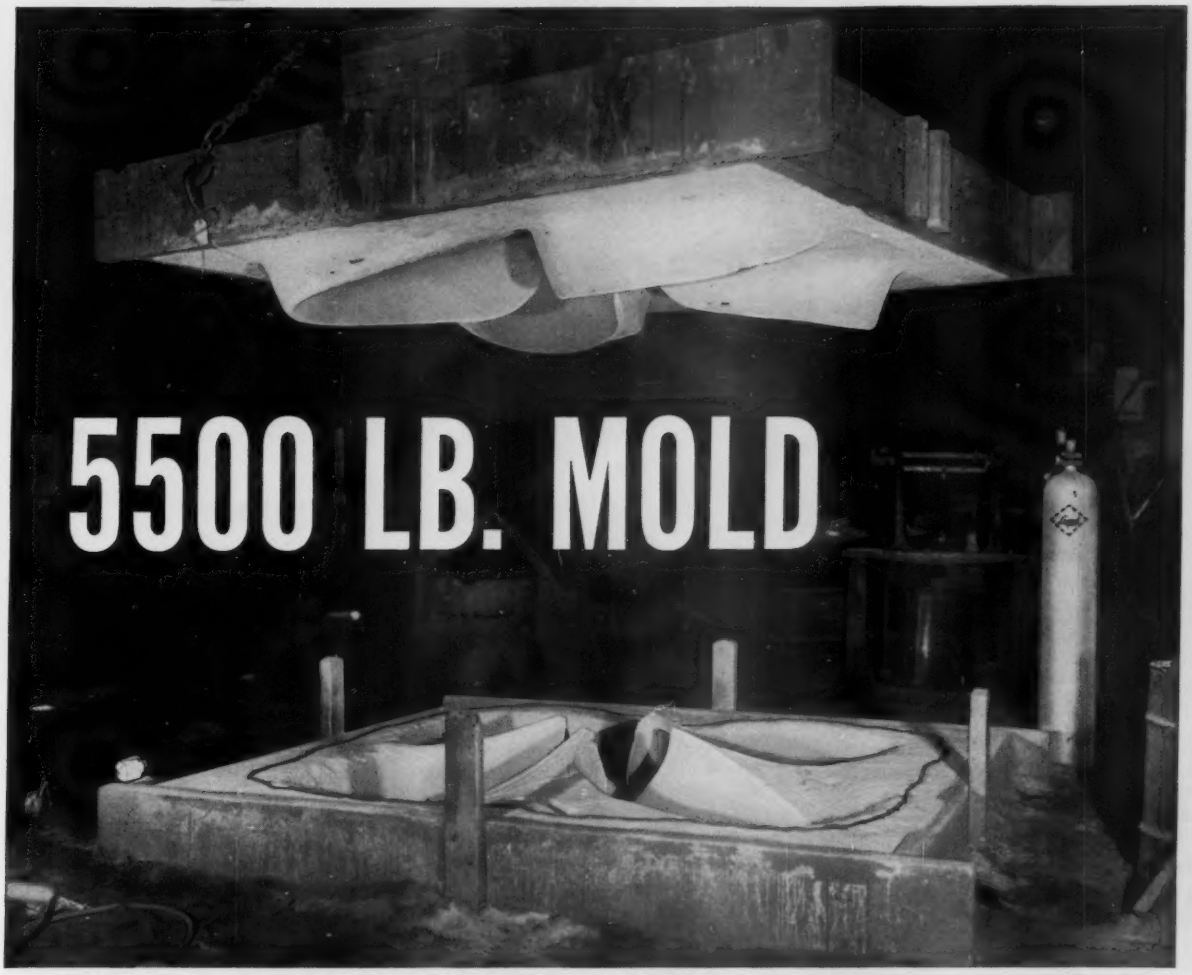
Film Studies Joined Sections In Castings and Weldments

A 16-mm, sound, black-and-white film with a running time of 27 minutes, "Photoelastic Studies of Joined Sections in Castings and Weldments," is available to technical societies and colleges from the Product & Market Development Committee, Steel Founders' Society of America, 606 Terminal Tower, Cleveland.

Data for the film were derived from a research project entitled "A Study of Engineering Characteristics of Steel Castings and Equivalent Strength," sponsored by the society during the last four years at Case Institute of Technology. Photoelastic studies and comparative data contained in the film are from prior research work in the project.

Corner designs selected for study represent those observed in practice and some modifications which the research indicated were preferable to previous designs. Welded sections were obtained from designs recommended by the Welding Handbook and welding firm research engineers. The film reveals photoelastic properties of both cast and welded corner sections.

CO_2 CURES



IN 40 MINUTES!

Fast, bakeless hardening of molds for large castings—like this one for 3400 pound nickel aluminum bronze propellers—is standard procedure at Columbian Bronze Corporation, Brooklyn, New York.

In addition to tremendous savings in time, Columbian Bronze reports these added advantages from CO_2 curing. no baking required • far fewer gaggers needed • elimination of need for extreme skill necessary in green sand molding • no danger of drops, soft spots or wet spots in mold • molds may be left for several days before pouring.

For complete facts and technical data on how CO_2 mold curing will revolutionize your operation, contact

World's Largest Producer of

LIQUID CARBONIC

DIVISION OF GENERAL DYNAMICS CORPORATION

3150 South Kedzie Avenue • Chicago 23, Illinois

Circle 673 on Page 51

Four men guide the foundry's activities; left to right: Everett E. Hart, works manager; Ralph M. Hill, president; Lloyd C. Farquhar Jr., vice president, and, standing behind Mr. Farquhar, Gene Nevius, sales manager

Sales Promotion Campaign
Produces New Business

By **ROBERT H. HERRMANN**
Associate Editor

FOUR young men who guide activities of East St. Louis Castings Co., East St. Louis, Ill., have embarked on a sales promotional program that is paying off in new customers and increased business. Company president Ralph Hill, vice president Lloyd Farquhar Jr., sales manager Gene Nevius, and foundry manager Everett Hart are enthusiastic about early results of the program which indicate a previously unrecognized potential market for the company's castings.

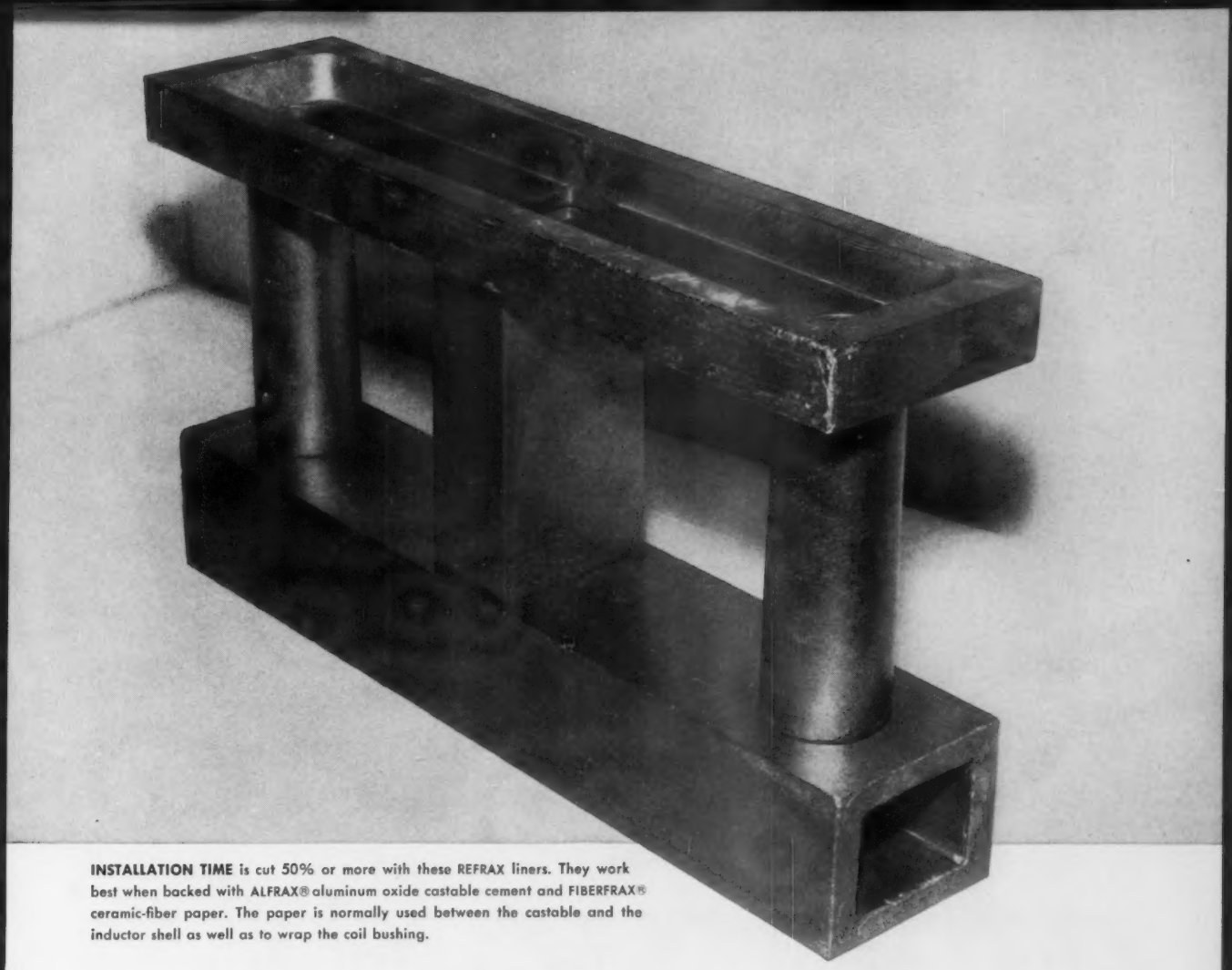
The foundry produces gray and alloy iron castings in weights from less than 1 lb to 200 lb. Plant capacity is 1200 tons per month with about 300 employees.

Current sales effort started in July, 1956, when a brief questionnaire was mailed to a group of companies whose business indicated that they might use ferrous castings. This questionnaire asked merely if the recipient used gray iron castings and if it was interested in shell molding. The mailing list was compiled from names purchased from a mailing list house and expanded with company names secured from Chambers of Commerce within the 300-mile radius the foundry wanted to cover.

Returns Are High—An excellent return of 50 per cent was realized on the questionnaire. The favorable experience led to development of six promotional folders which are being alternated with material prepared by the Gray Iron Founders' Society on a monthly mailing schedule. The foundry's mailing pieces were designed and prepared by a local advertising agency. Monthly mailings started in April, 1957, to 300 prospects developed by the questionnaire plus 200 customers, past customers, and previously known prospects.

A reply card asking similar information to that requested on the original questionnaire and asking, also, if a representative should call

The promotional program includes dissemination of mailing pieces such as shown at left



INSTALLATION TIME is cut 50% or more with these REFRAX liners. They work best when backed with ALFRAX® aluminum oxide castable cement and FIBERFRAX® ceramic-fiber paper. The paper is normally used between the castable and the inductor shell as well as to wrap the coil bushing.

When Ajax-Tama-Wyatt inductor units melt aluminum, this

REFRAX® liner stops dross penetration

Here's a new channel lining for Ajax-Tama-Wyatt inductors that lasts longer than other materials . . . cuts cleaning and assembly time . . . reduces melting costs. It's REFRAX® silicon-nitride-bonded silicon carbide.

Dross can't penetrate and adhere to REFRAX liners because aluminum *can't wet* this refractory. Its smooth surfaces and low permeability stop metal penetration and build-up in the vertical and horizontal channels. As a result, the channels don't get progressively smaller and more difficult to clean —as they do with cast or rammed materials.

And the normal 8 or more hours it takes to ram a lining in an Ajax inductor has been sliced to 4 by using REFRAX channel liners (with ALFRAX® castable back-up cement).

REFRAX refractories can be formed into intricate parts—threaded, thin section, close tolerances—with outstanding corrosion resistance (even at temperatures well over 2,000 F). Consider, too, these properties: Tolerances of ± .005 in./in.; a modulus of rupture of 5600 psi at 2450 F (even the best heat resistant alloy melts below this temperature); and high heat conductivity that approaches that of chrome-nickel steel. Write today for further information about the outstanding properties of REFRAX refractories. Address Dept. C-48, Refractories Division, Carborundum Company, Perth Amboy, N. J.

CARBORUNDUM

Registered Trade Mark

Circle 674 on Page 51

CARB-RITE
IN THE METALLIC MIX

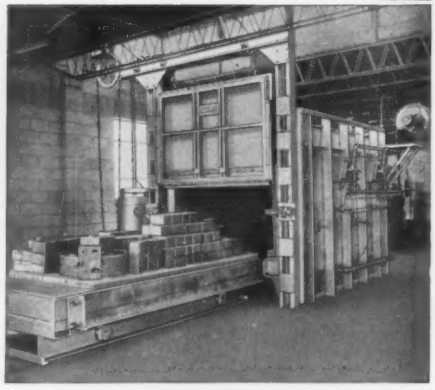
CARB-RITE, properly sized for charge carbon and used as a substitute for pig iron in the metallic mix of open hearth, air furnace, and cupola charges, yields approximately 85% efficiency of the contained carbon in the acid process, and approximately 70% in the basic process. CARB-RITE definitely does not produce a heavy, mucky slag condition which reflects heat to the furnace lining, causing same to sweat badly during the refining period. When CARB-RITE is used, the silicon in the charge can be pegged at any point found to be advantageous to the operation of the furnace, consequently, considerable less fluxing in the basic process is necessary, affording a better heat transfer to the charge, due to the greater slag fluidity.

CARB-RITE
COMPANY
1815 HALSTED ST.
CHICAGO HEIGHTS, ILL.

Circle 631 on Page 51

For Normalizing, Annealing and Stress Relieving

JOHNSTON
CAR BOTTOM
FURNACES



Engineering experience is apparent in the smooth operation of the Johnston Car Bottom Furnace. Roller bearings in car and door hoist shafts, mechanical car seals, and power operated car pullers are just a few of many practical features. Johnston "Reverse Blast" low pressure burners for oil or gas assure clean, economical, efficient heat for annealing, normalizing, and stress relieving.

Write for Bulletin F-240

Johnston Equipment for the Foundry
● Melting Furnaces ● Heating Torches ● Ladle Heaters
● Heat Treating Furnaces ● Burners, Blowers, Controllers
Over Thirty Years Experience in Design and Manufacture.

THE JOHNSTON LINE GUARANTEED
JOHNSTON MANUFACTURING CO.
2825 EAST HENNEPIN AVE.
MINNEAPOLIS 13, MINN.
ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

Circle 632 on Page 51

was enclosed with the June mailing. Information on the returned cards, questionnaires, and other inquiries resulting from the mailings is recorded on an area basis to determine if stronger advertising effort or personal sales calls should be concentrated in any particular area.

Sales calls on potential customers developed by the questionnaire and mailing pieces are made by Mr. Nevius. The foundry's chief inspector makes service sales calls on customers. Personal calls also are made by Mr. Hill, Mr. Farquhar, and Mr. Hart. A recently developed catalog describing foundry facilities and services is given to new customers when they are visited.

Maintaining a Service—Once a prospect becomes a customer, a representative from the foundry contacts him on regularly scheduled visits to offer service. Such visits give the foundry representative an opportunity to become familiar with the customer's problems. Increased business has been obtained on these visits by convincing the customer that castings can do a better job more economically than parts fabricated by other methods. Furthermore, the frequent visits permit the foundry representative to be in on the ground floor when new equipment or design changes are being contemplated. The result is that castings have been designed into the new equipment.

Co-ordinating the entire foundry operation into a smooth-running back-up for any sales effort is an essential part of an over-all marketing program. This result is achieved at East St. Louis Casting Co. by providing a modern engineering design service to customers. Production scheduling is done by an office man under the direction of the sales manager. Daily meetings are held with production department heads to coordinate new orders and work in process.

The company's quality control program divorces the casting inspection responsibility from the cleaning room authority. Inspectors are responsible to the company president.

Prices in Line with Costs—A policy of continual price revision keeps the company's castings prices in line with current business conditions. Accurate costing methods based on accepted good practice assure proper apportionment of costs to each casting job. In that way each customer is quoted a fair price based on the work involved to produce his particular castings.

An important phase of good mar-

keting practice is a courageous attitude on the part of management to follow good business policies. A recent incident is a case in point. During a slump in foundry activity the company lost an order from a long-time customer to a lower bidding foundry. Cost factors entering into supplying the castings were explained to the customer, but he placed his order with the low bidder. Meeting the cut-rate price would have brought unprofitable business into the shop, and few foundries progress or even survive if they become involved in costly price cutting.

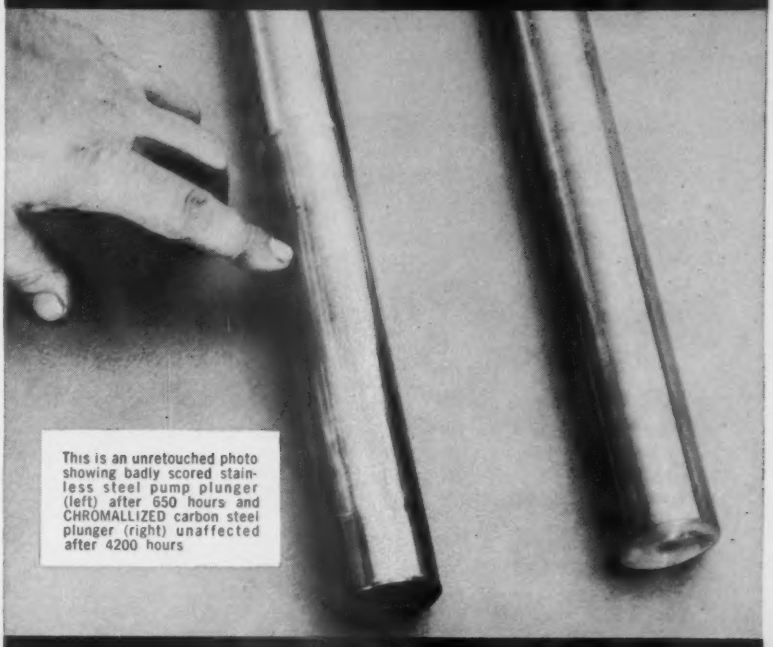
Facilities Kept Modern—Additional evidence of good management by these men can be seen in the continuing modernization of the foundry. Although East St. Louis Castings Co. was one of the early mechanized foundries (the present foundry was built in 1929), over the past seven or eight years a revised sand system, annealing furnace, conveyor systems, a shell molding department, new shipping room and truck dock facilities, and modest laboratories for quality control, research, and experimental work have been installed.

Production of alloyed iron has expanded the foundry's ability to satisfy customer requirements. Good housekeeping practices which reach their zenith in the cleanest, most orderly cleaning room which an observer could hope to find have built good worker morale and increased efficiency of operation.

These are the marks of today's concept of modern foundry management. Each foundry operation is a functional part of an efficient castings production machine which can be put to the service of the customer through the sales organization. It is a complete program.

"My name's Lee, all right, but I still say you have the wrong Lee's"

Do you use water pressure to clean castings?



This is an unretouched photo showing badly scored stainless steel pump plunger (left) after 650 hours and CHROMALLIZED carbon steel plunger (right) unaffected after 4200 hours

CHROMALLIZED POWER PUMP PLUNGERS LAST 2400 HOURS LONGER. COST 28% LESS

PLACE: Elyria Foundry, Elyria, Ohio.

APPLICATION: Vertical power pump generating pressures up to 2200 psi used to clean sand castings.

PROBLEM: Plunger abrasion from sand particles in the atmosphere.

SOLUTION: CHROMALLIZED carbon steel plungers.

Material	OLD PLUNGER 420 Stainless	CHROMALLIZED PLUNGER Carbon Steel
Price	a. (Purchase) $42.50	$75.00
	b. Regrinding (twice) $15.00	—
	c. Maintenance $47.50	—
	d. Total $105.00	$75.00
Service Life	(With 2 regrindings) 1800 hrs.	4200 hours

CHROMALLIZING is a patented chromium diffusion process which provides a surface as hard and wear resistant as chromium carbide.

Chromalloy Corporation is equipped to CHROMALLIZE your existing pump plungers or provide new replacement parts.

Chromalloy CORPORATION

450-A Tarrytown Rd. • White Plains, N. Y. • WH 6-0020

Circle 634 on Page 51

Speaker's table at the pre-conference dinner in Chattanooga, Tenn.

Operating Practices Discussed at

SOUTHEASTERN FOUNDRY CONFERENCE

By FRANK G. STEINEBACH
Editor

APPROXIMATELY 325 attended the 26th annual Southeastern Regional Foundry Conference held at Chattanooga, Tenn., Feb. 20-21. The meeting was sponsored by the Tennessee, Birmingham District, and the University of Alabama Student Chapters of AFS.

Speaking on "Recent Important Legislation Affecting Foundries," Herbert J. Weber, director, Safety, Hygiene and Air Pollution Control, AFS, stressed the need for foundrymen to resist unfair or unreasonable legislation which places the industry at a competitive disadvantage. He indicated, however, that foundries can satisfy their obligations to employees and neighbors with less expense by doing it voluntarily than by waiting to have unreasonable laws forced upon them.

Mr. Weber discussed the unfairness of expanding the ASME Model Smoke Regulation Ordinance to cover metal melting operations, the inaccuracy which develops in using incorrectly the Ringelmann chart for measuring non-black smoke emissions, such as in a cupola, and undesirability of statewide air pollution laws and numerous area smoke control ordinances.

Among the conference participants were, left to right, Harry W. Dietert, AFS president; L. H. Durdin, AFS vice president; G. Frank Anderson and E. C. Seman, Tennessee Chapter chairman and director, respectively

M. J. Henley, vice president, Tyler Pipe & Foundry Co., Tyler, Tex., described a water-cooled cupola used by his organization, and discussed some of its advantages and disadvantages. The cupola is externally water cooled, free of a lining with the exception of the well, and has protruding copper tuyeres. The cupola has been operated continuously for as long as 15 days, 24 hours a day, with the exception of one bank-over period of approximately 8 hours. The company believes the cupola could be operated continuously for one to two months, especially if equipped with two tap holes at right angles to each other. The cupola can be operated acid, basic, or neutral and can take considerable punishment.

Mr. Henley said tonnage demands can be varied as much as 100 per cent, provided bed height and coke requirements are predetermined. It has considerable leeway in the amount of scrap that can be used, produces clean iron which is very fluid, produces iron with good physical properties, cuts metal loss, saves manganese, has low refractory cost, and can produce nodular iron. Disadvantages include high cupola investment, need for skilled operators, scaling and cracking of the shell, loss in efficiency due to water, and repair costs.

Tom E. Barlow, sales manager, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, presented an interesting discussion entitled "It Ain't Necessarily So." Certain statements which are considered almost axiomatic by foundrymen are not always true, he said. For example, many believe it is best to use as

THE MORE SNAGGING WHEELS YOU USE the more you need·····

NEW MACKLIN B-20

RESINOID BONDED SNAGGING WHEELS

B-20 Gives fast, fast cutting action.

B-20 Gives improved "G" ratio. Removes more metal per wheel.

B-20 Has more heat resistance.

B-20 Is versatile. Tops for swing frames, automatics, floor stands, portables, *cut-off, too!*

B-20 Gives better impact resistance because of higher tensile strength.

B-20, Macklin's newest "Wheel of Profit" cuts time and costs on so many every day snagging jobs. IN THE FOUNDRY, it eats up fins, gates, and risers at a fast clip. And, the money they save, the job they do on BILLET GRINDING. On this tough job, in test after test, B-20 proved tops! For production cutting, on high speed cut-off machines, the new B-20 cut-off wheel cuts bars, rods, angles, tubes and flats with speed and economy.

Try a B-20 in your plant, on your own job. A letter or phone call to your nearest distributor is all that's needed. If you prefer, write us direct. We'll do the rest.

NEW B-20 FOLDER, YOURS FREE!

For complete specifications and user reports send for your copy. You'll find it's a smart move.

GRINDING WHEELS

MACKLIN company Dept. 22, Jackson, Mich.

Macklin of Canada, Ltd., Harrow, Ontario, Canada

Circle 677 on Page 51

Extra Power

FOR HEAVIER CUTS

Ingersoll-Rand

AIR GRINDERS

YOU CAN MEASURE the extra amount of metal removed by an I-R Grinder, and you can count the savings in time and costs! Designed to give you highest possible production, I-R Air Grinders have these outstanding features that provide maximum staying power, minimum weight, absolute safety:

1. Overspeed Safety Coupling—prevents excessive wheel speeds
2. Increased Power—air motor has new off-set vane design
3. Maximum Rigidity—one-piece housing supports widely-spaced, arbor bearings
4. Quiet Adjustable Exhaust—efficient muffling with adjustable deflector
5. Maximum Valve Efficiency—rubber-faced throttle valve assures trouble-free operation

Ingersoll-Rand the leader in Grinders offers a total of 121 different sizes!

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fine a sand as possible. But going to fine sands causes loss in flowability, which may have more to do with finish than fineness of the sand. Excessive fineness also may affect hot strength or expansion characteristics adversely.

Another example cited was "keep the sand as dry as possible." This makes a lot of sense, according to Mr. Barlow, but in making the sand as dry as possible, you may be doing something not desirable. If a high strength is wanted, small changes in moisture will have great effectiveness. Water, he pointed out, is a cheap binder for dry strength.

J. G. Kura, chief of the Metallurgy Div., Battelle Memorial Institute, Columbus, Ohio, in discussing the "Effect of Gating Practice," said that research in gating provides sound, intelligent direction to the design of an effective gating system. Principles of gating are based on two assumptions: 1. The ladle lip is close to the pouring basin. 2. The basin is filled quickly and kept filled.

Objectives of the gating system are: 1. To reduce turbulence in gates and mold. 2. To reduce opportunity for dross formation. 3. To prevent entrainment of air or mold gases by avoiding conditions that would create aspiration. 4. To decrease the velocity of the stream of molten metal and thereby minimize erosion of mold and cores. 5. To take the art out of pouring.

Principles of gating, sometimes referred to as ratio gating, are based on laws of hydraulics, and therefore apply to all metals. The extent to which the principles need to be applied depends on the cleanliness desired, design of casting and type of metal being cast. Radiographically clean castings of intricate design from metals that dross readily will require careful application of all the principles.

Henry Marius, manager, Lenoir Car Works, Lenoir City, Tenn., said that physical metallurgy has become so important to the foundry that it cannot operate successfully without the services or guidance of a competent metallurgist. Mr. Marius pointed to problems created in cupola melting because the coke bed was too low and in electric furnace melting where time was not allowed to bring the metal to proper temperature. Usually bull ladle additions were undertaken to offset the lack of good melting fundamentals, without much improvement. Mr. Marius also complained of the stagnation in the field of railroad specifications, which, he

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Beach wear by Jantzen

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METAL BLAST, INC.

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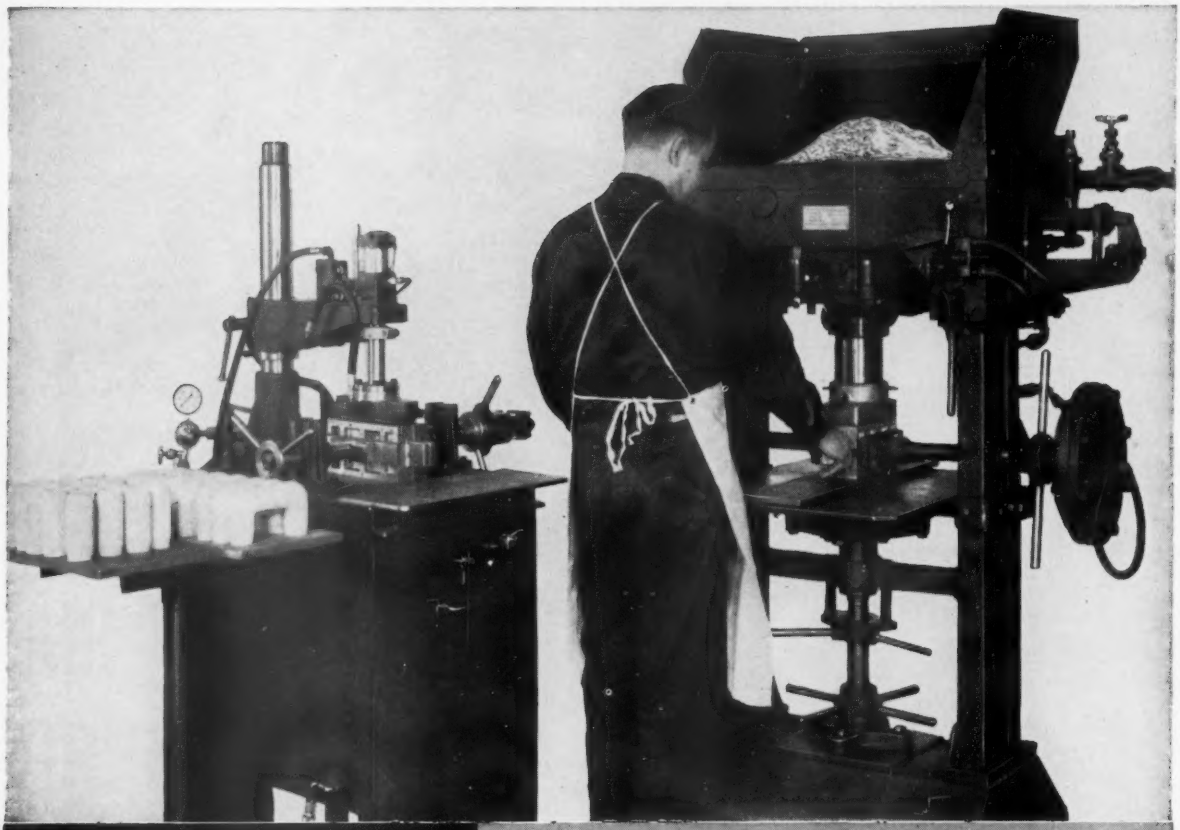
Circle 679 on Page 51



Redford

NO. 4 CORE BLOWER with AUTOMATIC CO_2 CORE HARDENING STATION

The *right tools* to assure uninterrupted production if you make cores by the CO_2 Process.

One core box is being blown while another one is automatically clamped, the cores hardened in the core box and the core box released ready to remove finished cores. If core boxes are suitable, cores can be mechanically stripped as shown in the picture at the right.

The Core Hardening Station is completely air operated. Automatic time cycle is quickly adjusted to meet job requirements.

Whether you blow cores with conventional sand mixtures or use the new CO_2 Process, REDFORD equipment gives you the *best* in over-all performance.

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stated, have had no worthwhile changes in many years.

B. L. Meredith, American Smelting & Refining Co., South Plainfield, N. J., discussed "Major Aluminum Casting Problems and Their Solutions." Mr. Meredith pointed out that major problems occur from poor gating and pouring practices, and to a lesser degree from improper melting. Basic principles of melting, pouring, and gating were discussed with particular emphasis on points where deviations from proved practices frequently take place.

W. R. Weaver, president, Modern Pattern & Plastics Inc., Toledo, pictured the steps required in the construction of epoxy resin patterns and coreboxes. Some advantages include ease of duplicating existing patterns; accuracy of duplication; low cost; ease of repair; good sand release characteristics; durability.

Victor E. Zang, vice president, Unitcast Corp., Toledo, told of the problems encountered in controlling the pH factor and specifying it on bentonite used in the steel foundry industry. A new testing method included in a western bentonite specification recently developed by the Steel Founders' Society of America (FOUNDRY, March, 1958, p. 127) was discussed and illustrated. Mr. Zang stated that under present conditions his company will purchase and qualify bentonite under SFSA specifications, but will continue to run green and dry strength tests. All tests must be run before the car of bentonite is unloaded.

Leroy A. Bizzell, methods engineer, U. S. Pipe & Foundry Co., Chattanooga, discussed "CO_2 Process and Coremaking." Mr. Bizzell described some of the problems encountered in getting the CO_2 operation running, including selection of the proper silicate, additives to provide desired collapsibility, and mulling time.

He pointed out that the company is saving in material cost about 30 cents per hundred pounds of sand by using the CO_2 method. Other savings include equipment costs and maintenance costs for machines and ovens. He said that while the process does make a good core at relatively low cost, it is not a cure-all.

Other speakers included Harry W. Dietert, president of AFS, who spoke on the power of man to progress; Lewis H. Durdin, vice president of AFS, who presented information on society activities; Leo Aikman, Atlanta, who spoke at the banquet on automation and the individual, and Frank G. Steinebach, editor of FOUNDRY, who talked at the opening session on the future of the foundry industry.

Editor's Note: Photos by courtesy of Edwin H. Phelps, American Cast Iron Pipe Co., and Carl Fischer, Fischer Supply Co., Chattanooga.

ON THE PROGRAM AT CHATTANOOGA . . .

L. A. Bizzell

J. G. Kura

A. B. Schwarzkopf T. E. Barlow

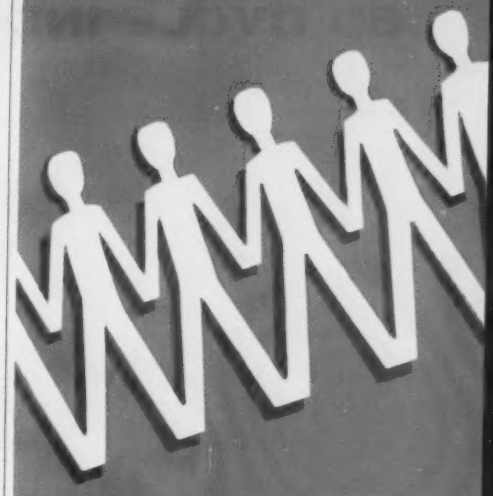
F. G. Steinebach

V. E. Zang

B. L. Meredith

Henry Marius

Circle 681 on Page 51→



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If you've had disappointing variations in monthly control of blast cleaning costs—try Malleabrasive.

Malleabrasive has the uniformity of metallurgical structure from one lot to the next that has leveled out the cost chart line in many of America's largest foundries and other metal working plants. Not only leveled—but lowered!

The full and complete Malleabrasive process itself—used by ourselves exclusively—provides a degree of uniformity unmatched in the metal abrasive field.

Whatever your blast cleaning job, Malleabrasive will do it well, and will repeat uniformly, from month to month. Write us for information.

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60 CYCLE INDUCTION MELTING

Melting metals in the 60 cycle induction furnace will bring greater economy and quality to your melting and casting operations. Whether you produce zinc or aluminum die castings, brass or bronze castings, ductile iron castings, or aluminum extrusions — to name but a few fields — there is an induction furnace to do your job.

60 cycle induction melting will reduce metal losses to a minimum and eliminate metal contamination. Alloy composition is maintained uniformly, and metal temperature is closely controlled at all times. Operating conditions are ideal: worker fatigue is reduced significantly.

AJAX ENGINEERING CORPORATION has specialized in just this one field: building the best and most efficient 60 cycle induction melting furnace for the job. As pioneers of this melting principle we have accumulated considerable experience in each field of application.

AJAX induction furnaces have been instrumental in establishing new metallurgical processes such as continuous casting, continuous galvanizing, and aluminum coating of steel. Exclusive AJAX developments are the electromagnetic pump and the AJAXOMATIC for controlled pouring.

AJAX 60 cycle induction melting furnaces range in size from 20 kw to 2000 kw, produce from 150 pounds per hour up to 40 tons per hour.

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ENGINEERING CORPORATION

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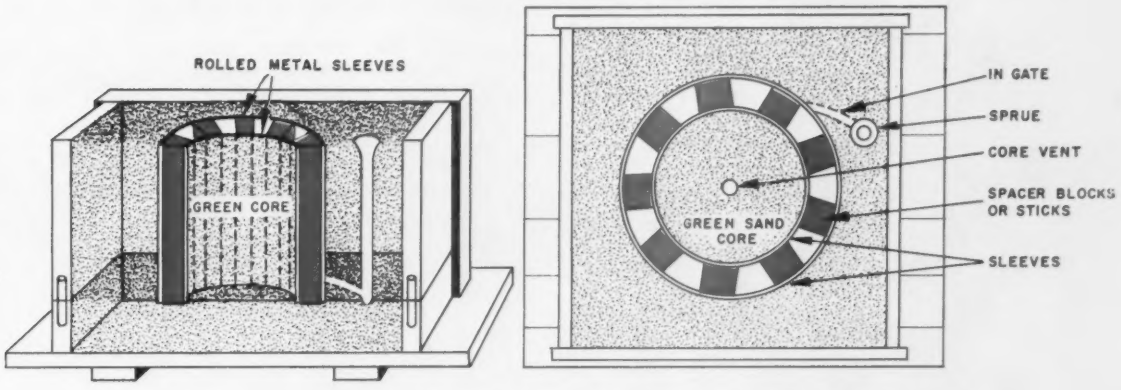
Associated Companies: Ajax Electric Company Ajax Electrothermic Corp.

Trouble Shooting

By C. W. AMMEN



Drawings show, left to right, side and top cross sections of mold for a bushing made with galvanized sheet steel sleeves used as patterns

Sheet Metal Bushing Patterns

Dear Charlie:

When we get into bushings with more than 10-in. OD, we run into a pattern problem. The loft is loaded with bushing patterns with and without flanges. If somebody wants a bushing with 27-in. OD and 25-in. ID, we lag or stave up a pattern—then up in the loft she goes. Next time, we may be making a job with 25-in. OD and 23-in. ID, or some such. Making up a pattern, even a short one, which can be drawn up to length is a lot of humbug. What's the best way out, patternwise? We're running out of storage space.

Sincerely,
Sam

Dear Sam:

Bushings are and always will be a problem for the general jobbing foundry. There really is no end to the types of pattern equipment and rigging used.

Everything from sweeps to full pattern with dry sand cores is used. If you could stay with it long enough, you probably would wind up with a fairly complete collection of patterns.

By far the cheapest type of equipment which can be used to produce a large range of both inner and outer diameters is a series of galvanized sheet steel sleeves or cylinders. These not only are cheap in first cost, but take up little storage space when nested. Properly handled and taken care of, they last for years. What we used to do was this: As we received an order for a big fellow for which we had no pattern equipment, we had a local sheet metal shop roll us up one cylinder to the OD we wanted and another which had an ID corresponding to the diameter of the core we wanted. Before long we had a fine collection which gave us a large range of combinations.

These bushings were made up with a drag and cheek, with no cope, to allow length for feed and chucking. After machining, this section was parted off and returned for credit. You can, however, make a cope if you choose.

Let's consider your 27-in. OD, 25-in. ID bushing, using sleeves. We need two sleeves, one for the ID and one for the OD. Of course, these are rolled with casting shrinkage allowed for—that is, to pattern dimensions. Make sure when you have a sheet metal shop roll a sleeve for you that you give him pattern dimensions or supply him with the correct shrink rule to go by. You also can have the sleeves rolled with a bit of taper for draft if you like.

The molding procedure is simple. A drag is rammed up blank, rolled over, and placed on a firm, level bed. The sleeve which is to make the core is placed in the center of the drag and tapped down into it a short distance. It then is lifted off, and the sand inside on the drag is cut up with a trowel so that when the core is rammed there will be no parting where it attaches to the drag. The inside sleeve is returned to its socket and checked

Quality of melt masking your profit picture?

Chief Keokuk's masks usually meant trouble for the spooks. But Junior's hep to real quality! While Princess Wenatchee tom-toms the traveling music, he's bobbing about 'neath a mask of his own . . . one that's bound to bounce the evil spirits for good!

HIGH COSTS AND POOR QUALITY ARE REAL DEMONS

Send 'em scampering with Keokuk Silvery Pig Iron, the superior form of silicon introduction that helps foundries and steel plants control the uniformity of every melt. Handle by magnet, furnace-charge by weight, or count the pigs for equal accuracy. Aluminum producers, choose Keokuk Silicon metal every time!

Keokuk Electro-Metals Company, Keokuk, Iowa;
Wenatchee Division, Wenatchee, Washington

KEOKUK **SILVERY PIG IRON**
SILICON METAL—OTHER FERROALLOYS

When you think of SILICON, think of KEOKUK!

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Keokuk Silvery Pig—the superior form of silicon introduction—is available in 60 and 30 lb. pigs and 12½ lb. piglets in standard analysis or alloyed to your specifications. Silicon metal and ferro-silicon are supplied in standard sizes and analyses.

with a large square or level to insure that it's vertical.

The sleeve for the OD then is placed over the ID sleeve. Between the two sleeves, we place a suitable number of spacer sticks of the correct width and length, which we cut on the circle saw. Check again with level or square, then check for even spacing to insure concentricity between OD and ID and for correct wall thickness. Now you have it by the tail on the downhill side.

Put the cheek on, ram the core, and check again. Of course, make a parting at the drag cheek joint and provide a core vent and a suitable sprue arrangement. When the mold is rammed up, vented, and what have you, remove the spacer sticks, draw off the cheek, and place it on horses. Rap and remove sleeve from cheek. Skin dry, dry black, or leave her green, as is your choice. Reassemble cheek and drag, clamp, dog core, and pour off.

The sleeves can be rolled with a lap joint or welded. The lap joint is fine; it's cheaper and works well. The joint can be sleeked down in the mold or left, if you like.

This system works fine for making cement-bonded bushing molds. Just give the sleeves a light coat of lube oil and draw them when the cement has taken sufficient set. If by chance you have a bushing with a small ID with respect to the OD, one which would require wide spacer sticks, a sleeve or sleeves of the proper size can be put between the OD and ID sleeves. This method permits you to use narrow spacer sticks.

You can use sheet metal for many applications in the foundry. Half-round, dry sand coreboxes are made easily by rolling a half-round section and boxing it in with suitable ribbing. With small shears and a little set of rolls, you can do all kinds of tricks.

Sincerely,
Charlie

Offers Papers on Magnesium

Bound copies of the 14 principal addresses and technical papers presented at the 13th annual convention of the Magnesium Association have been published in a 160-page well illustrated booklet. Built around the theme of the meeting, held in New York during October, *Magnesium in Perspective* is available from the office of the association at 122 East 42nd St., New York 17, for $5.

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15,000-20,000 lb. Capacity Yale Gas Trucks Give You 3 Big Extras!

1. EXTRA VISIBILITY. Wide-spaced, nested channels and high-center driver's seat combine to produce Yale's exclusive Wide-Angle Vision—good for 300% more visibility.

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3. EXTRA FAST CYCLE OPERATION. Full loads lifted at 60 ft. a minute—fast, controlled lowering—travel speed up to 20 mph.

Other features of these husky, easy-to-maintain Yale Gas Trucks include H-beam side members in frame for extra strength—channels mounted on ball bearings to reduce friction—ball-mounted, self-aligning hoisting cylinders. Available with fully automatic transmission, fluid coupling or standard transmission—choice of gas or LP-gas models. For further information write for Bulletin #5230, The Yale & Towne Manufacturing Co., Dept. A-344, Philadelphia 15, Pa.

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WAREHOUSERS • HAND TRUCKS • HAND AND ELECTRIC HOISTS

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News Views

WEST COAST CONCLAVE: Officers of AFS chapters in District 5 held their first annual meeting Feb. 5 at Berkeley, Calif. Seated, left to right, are Harry K. McAllister, Portland, Oreg.; Otto H. Rosentreter, Los Angeles; John R. Russo, national director, Oakland, Calif. Standing—E. C. J. Bird, Vancouver, B. C., and Gordon Martin, Richmond, Calif.

SAFETY SCHOOL: Philadelphia safety groups are sponsoring a series of eight weekly courses to promote safer, more efficient operation of industrial trucks. Here Donald L. Chance, safety engineer, Yale & Towne Mfg. Co. and training course committee chairman, shows operator the best way to remove storage batteries from trucks for charging. Equipment for the courses is provided by Yale & Towne and Exide Industrial Div., Electric Storage Battery Co.

ICA IN COSTA RICA: Prof. C. C. Sigerfoos, Michigan State University, is on a three-months' International Co-operation Administration assignment with foundries and machine shops of Costa Rica. Standing at left are Alberto Golcher, Costa Rican Industrial Development Center; Prof. Sigerfoos, and Eduardo Rojas, owner of this foundry at San Jose

APPRECIATION: Kenneth C. Bulkeley, right, president, American Sanitary Mfg. Co., Abingdon, Ill., receives a gift as retiring president of the Plumbing Brass Institute. His successor, John D. Clemens, vice president, Hays Mfg. Co., Erie, Pa., made the presentation at the institute's annual meeting

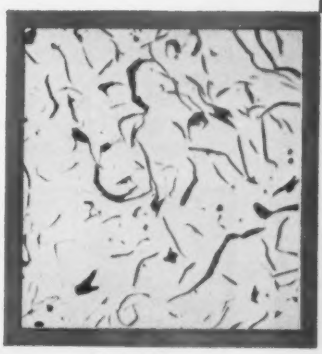
No. 8® GRAPHITIZER

TREATS GREY IRON EFFECTIVELY FOR LESS THAN 10¢ PER TON!

Thousands of foundries are already employing No. 8 because it is such an amazingly simple and accurate graphitizer. No. 8 is a powerful inoculant. It plants graphite *throughout* the molten metal. No. 8 gives castings a higher machinability rating. It reduces chill and hardness in thin sections and improves wear and shock resistance. No. 8 makes castings more metallurgically uniform and, most important of all, No. 8 graphitizer *substantially reduces the cost of metal control* (cost figures in several foundries are below 10¢ per ton of metal treated). No. 8 is easy to apply by funnel or envelope method. As the photomicrographs shown here indicate, No. 8 is effective for special metallurgical control. From every standpoint it will pay you to use No. 8, regularly. For further details write for Engineering Bulletin No. 2.

Base Iron

Photomicrograph from broken half of 1.25 arbitration bar of gray iron not treated with No. 8 Cupola charge was made up of 48% steel, 33% cast scrap, 19% malleable pig iron and 45 lbs. of silicon briquettes. Total charge was 2544 lbs. This iron tested to the following physical properties: Transverse Strength 2,497 lbs. (wedge bar) • Brinell Hardness 229 (wedge bar) • Total Chill Depth 41/32 in., Clear Chill 26/32 in. • Deflection 0.23 in.



Treated Iron

Photomicrograph from broken half of arbitration bar of same base iron treated with 1 lb. per ton of No. 8. Holding time in ladle following addition of Graphite was less than 8 minutes. Note how the addition of No. 8 has destroyed the dendritic pattern and has given a normal flake pattern. The treated iron tested to the following physical properties: Transverse Strength 2,970 lbs. (wedge bar) • Brinell Hardness 217 (wedge bar) • Total Chill Depth 13/32 in., Clear Chill 10/32 in. • Deflection 0.31 in.

Note how the iron treated with No. 8 has increased in deflection. Usually iron treated with No. 8 will show an increase from 10% to 30% in deflection over the base iron value—this means less cracked castings and more serviceable metal.

GF240-1

THE UNITED STATES GRAPHITE COMPANY

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GRAPHITAR® CARBON-GRAPHITE • GRAMIX® SINTERED METAL PARTS • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

Circle 685 on Page 51

Finished cores made with DEXOCOR combine high tensile strength and scratch hardness with high resistance to cracking and distortion, yet shake out easily.

Big producers of steel castings are "performing miracles" with the revolutionary new binder—DEXOCOR.

They report that DEXOCOR substantially reduces mulling time, saves on bake time as much as 40%, assures clean interior surfaces that need far less machining.

DEXOCOR used with cereal binders aids moisture control, provides excellent flowability, quick, easy mixing, blowing, ramming—and a welcome reduction in core scrap. With high green strength, baked strength, and scratch hardness this remarkable new binder combines ready collapsibility, helps produce superior castings to closer dimensional tolerances despite intricate coring.

Says one of the country's top producers of steel castings, "The benefits were so obvious we changed over completely to DEXOCOR, now use it exclusively in sand mixes."

An 8-page report on the use of DEXOCOR Binder in steel casting is yours for the asking. Ask also about friendly help from our foundry specialists in the use of DEXOCOR for improved cores.

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BINDER

the perfect teammate for MOGUL® *and*
KORDEK® BINDERS • GLOBE® DEXTRINES

A water-soluble powder, DEXOCOR is convenient to handle, assures excellent flowability of sand mixes, contributes to uniform density of cores.

Uniform density throughout blown cores is assured by use of DEXOCOR. Sand mix fills recesses and corners as completely as other areas of box.

Increased thermal resistivity of cores made with DEXOCOR effectively curbs distortion and cracking, and also improves their collapsibility.

Circle 686 on Page 51

WISCONSIN FOUNDRYMEN

Meet in 21st Annual Conference

By **WILLIAM G. GUDE**
Managing Editor
EDWIN BREMER
Metallurgical Editor
and
ERLE F. ROSS
Chicago Editor

ANOTHER in its long series of successful regional foundry conferences was held by the Wisconsin Chapter of the AFS in cooperation with the University of Wisconsin at the Hotel Schroeder, Milwaukee, Feb. 13-14. Registration totaled nearly 700.

Heading the committee in charge of the conference were Norman N. Amrhein, Federal Malleable Co., chapter president; Leslie J. Woehlke, Grede Foundries Inc., chairman, and L. S. Krueger, Pelton Steel Casting Co., and Prof. P. C. Rosenthal, University of Wisconsin, co-chairmen.

In his welcoming address at the opening session, Dean Kurt F. Wendt, University of Wisconsin, referred to the educational trend away from practical courses and toward the sciences. A growing amount of research work on foundry subjects is being conducted at the university.

AFS President Harry W. Dietert, in tracing the expanded amount of mechanical power available to man, suggested that our greatest achievements will come through coupling thinking power with the maximum horsepower.

The cast metals industry has a grand future if we don't boot it, declared Allen M. Slichter, president, Pelton Steel Casting Co. "What we do in technical and market research will go a long way toward telling the story. Presently we are not giving research adequate financial support.

"Most important of all is brain power acquired from future generations who have had the advantage of high level technical educations. This must be a greatly expanded effort."

Left—Prof. George J. Barker, Gov. Vernon W. Thomson, Norman N. Amrhein at annual banquet. *Below*—William W. Maloney, Harry W. Dietert, Allen M. Slichter, and speaker Carl Taylor at luncheon. (Photos by Robert DeBroux)

Safety Aspects of New Processes—New foundry processes are accompanied by health and safety hazards to operators. These hazards should be understood and proper precautions taken, warned Dr. Edward G. Meiter, director, Industrial Hygiene Div., Employers Mutuals of Wausau, Milwaukee. Among his recommendations were these:

Shell Molding—Avoid skin contact with resins. Exhaust strong formaldehyde fumes. Prevent a dust explosion of dry resin by proper storage. Control dust in sand-resin mixing and handling. Control alcohol fumes when the solvent is used in coating. Store alcohol carefully (two workers have been killed by explosions in foundries). Avoid use of toxic release agents and handle flammable ones carefully.

Epoxy Resins — Be careful in handling the hardeners and catalyzed uncured resins; they can cause dermatitis, so avoid direct skin contact.

CO_2 *Process*—Sodium silicate is a strong alkali, and contact with the skin may cause dermatitis.

Twenty technical sessions were on the conference program, divided equally among the malleable iron, nonferrous, gray iron, steel, and patternmaking divisions.

Effective Profit Control, by R. K. Daily, Lester B. Knight & Associates Inc., Chicago. With less emphasis on high production, the time is ripe for management to re-educate its organization on the importance of cost control. It should adopt a program that will pinpoint the cause of excessive costs, fix the responsibility, and disclose the effect on the company's profits.

Tools in such a program include a standard cost system, departmental flexible budgets, sales forecast, production forecast, sales forecast, budget, administrative expense budget, financial forecasts, and monthly management control reports. While the break-even or profit point chart provides considerable information, the so-called "sales factor

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for ALL your requirements!

- Electric Furnace Roofs or Center Sections
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JOINTLESS CONSTRUCTION

EASE OF INSTALLATION

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Circle 687 on Page 51

chart," an inversion of the profit point chart, among other things also permits calculation of individual product cost at any level of production; indicates the cash outlay incurred by any order; and shows the required selling price for any desired profit margin, at any level of capacity utilization.

CO_2 Coremaking and Molding, by V. A. Guebard Jr., International Harvester Co., Milwaukee. Motion picture showed mechanized line for production of CO_2 barrel cores for tractor rollers. They are made in the molding department with a substantial saving in handling and material costs compared with previous practice. Scrap is less than 2½ per cent.

Hardening of Sodium - Silicate Cores, by Prof. Carl E. Wulff, University of Wisconsin. These cores can be hardened by the thermal, evaporation, or carbon-dioxide process. The first, hardening the core in a heated box, is adapted to a production setup. Evaporation is the cheapest process but too time consuming. Relation of tensile strength to different values for temperature, hardening time, and gassing time for the three methods of hardening was discussed.

Foundry Maintenance, by Fred Gunther, Belle City Malleable Iron Co. Maintenance records are important, but don't get bogged down with paperwork. Service requests should be made out in duplicate by authorized persons, and when the work is completed should be signed by the one doing the job. The accounting department should accumulate maintenance cost records for regular reports, which should go to persons who can do something about them.

Downtime records are important for pinpointing trouble with equipment.

Regular replacement of 10 ft at a time of an apron conveyor will avoid a week's shutdown for rebuilding the entire unit. Use of roller bearings can help cut maintenance costs considerably.

Conveyor belts should be cleared of hot sand before shutting down.

Safety and Industrial Health, by Walter Scholtz, Allis-Chalmers Mfg. Co. Conditions harmful to a worker's health generally may be termed chemical, physical, or biological hazards. Steps leading to their control include: 1. A physical and hygienic survey of plant conditions. 2. A compilation of the occupational history and analysis of the affected employee. 3. Complete information concerning materials and processes used. 4. Atmospheric sampling of materials combined with quantitative physical and chemical determinations. 5. The rating of a hazard compared with accepted standards. 6. An evaluation of the efficiency of protective apparatus and devices. 7. Adequate interpretation of this information so that it can be applied to the problem involved.

Help in evaluating health hazards can be obtained by foundries from their insurance company, a local or state health department, and the U. S. Public Health Service.

Good Aluminum Foundry Practice, by A. Nichamin, Federated Metals Div., American Smelting & Refining Co., Detroit. Customers should be urged to design castings for most economical production. Keep complete records on each job showing gating system, sand mixtures, charge weight, metal temperature, method of fluxing, scrap percentage, etc.

Types and causes of castings defects should be tabulated to aid in arranging for control that will prevent their recurrence. Among the principal problems which require correction are blow holes, dross inclusions, excessive turbulence, shrinkage, porosity, and cracks.

Cost Problems in the Cleaning Room, by O. H. Kraft, vice president, Westover Corp., Milwaukee. Inspection should not be confined only to the cleaning room; spotting defective castings before they have received cleaning operations can help to cut costs. Probably the principal opportunities for cost savings are in the layout of the cleaning room, arrangement of equipment, and material handling methods.

Follow a logical flow pattern and minimize rehandling of individual castings. Handling method adopted will depend on the volume of work, size of castings, and type of cleaning to be done. Where production of the same casting is fairly large, counting by weight and use of jigs and fixtures for speeding up cleaning often can save time and money.

How the Melting of Brasses and Bronzes Affects Casting Quality, by William M. Ball Jr., R. Lavin & Sons Inc., Cincinnati. No matter how good the mold and metal are, poor melting practice will result in inferior or defective castings. Improper practice causes gas absorption, spewing, sweating, and foaming.

Good quality brasses and bronzes can be obtained from any of several types of melting units when care and common sense are applied. Fast

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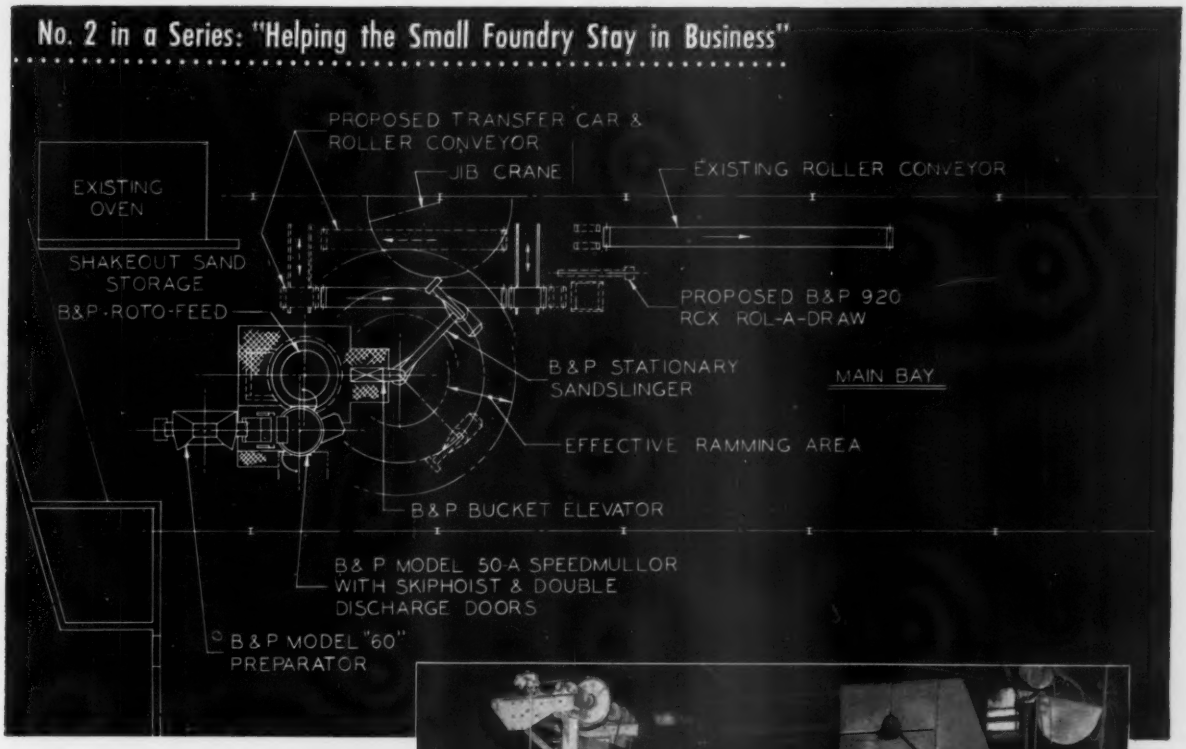

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The hard facts of small foundry operation brought Tom Anstey, the young owner of Anstey Foundry, Stevensville, Michigan, to these conclusions:

1. *His small foundry, started in 1945 with just twelve men, was being squeezed between a highly competitive casting market and the high costs of labor and material.*
2. *The only way to escape the squeeze was to raise production without raising costs, or to cut costs while maintaining production.*
3. *Mechanization offered the only answer and "Pay-as-you-go" mechanization was the only kind his small shop could afford.*

Tom Anstey found the solution in a 1-2-3 B & P mechanization program. Step 1—the installation of a Stationary Sandslinger in August, 1953. Step 2—a Model "50A" Speedmullor in August, 1955, and Step 3—a "60" Preparator in October, 1956.

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Circle 624 on Page 51

melting usually results in low gas pick-up. Attention should be given to combustion conditions to create a suitable atmosphere in the furnace. Pouring ladles should be heated thoroughly before use. Metal should not be heated higher than necessary if gas pick-up is to be minimized.

Coremaking and Coreblowing by Z. Madacey, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago. Improvements in coreblowers permit blowing of sands bonded with oil, dry binders, resins, or silicates into metal, plastic or wooden coreboxes. Naturally proper rigging of the corebox and blowplate is necessary.

At all times the magazine should contain sufficient sand. As large a blowhole as is practical should be used since the larger the blowhole, the less the air required to move a given volume of sand. That also results in less erosion on corebox surfaces. For heavy sands use of an agitator in the magazine is indicated.

Advanced Plastics, by Robert LeMasters, Nelson Pattern Co., Milwaukee, emphasized the need for overcoming resistance against plastics as a patternmaking material. The drawbacks of phenolic resins developed animosities to plastics which have lingered. Consequently, the recent introduction of the more useful epoxy plastics has not brought the recognition they deserve.

These liquid resinous materials have the desirable attribute of hardening from the inside out. Conversion is by allowing to stand overnight, usually at room temperature, or by application of heat. Epoxy patterns have good drawing characteristics, require little machining, can be repaired easily, and lend themselves well to pattern changes.

In early days, the foundryman was his own casting designer and patternmaker. Today, castings are designed and produced with many people participating—this is an age of specialization. This was the premise on which George Schuller, Caterpillar Tractor Co., Peoria, Ill., discussed **Economical Casting and Pattern Design.**

With many people involved in casting design, there must be an exchange of ideas. To control the cost of casting design is an economic problem, but with control economy is achieved. Some castings must be made as they are drawn up, but others can be compromised. Good design is achieved by the foundryman and patternmaker working together closely.

Pattern Equipment for the CO_2 Process—The place for the CO_2 process to be adapted to best foundry use is at the pattern level so that best conditions for the process can be incorporated in pattern and corebox equipment. This was the prime contention of James M. Venetucci, Liquid Carbonic Corp., Chicago.

Ten suggestions he made were: Provide large draft allowances, when possible; eliminate deep pockets; incorporate loose pieces to relieve deep pocket draws, or for areas which have little or no draft; make proper selection of screen or inverted slot vents; arrange proper distribution of vents not only for blowing but for distribution of CO_2; seal the parting line on coreboxes to prevent gas loss; use metal or wood plugs to produce a hollow core; use CO_2 sand for facing to improve casting surface; employ stack molding technique with the mold made up of CO_2 sand cores; and use duplicate coreboxes for production runs.

Answering a question, Mr. Venetucci said that production hardening of cores by CO_2 is economical in weights above 10 pounds; for cores weighing less than that, the process might prove uneconomical, depending on the core.

Final pattern session was an **Apprentice Program Forum,** ably directed by A. F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee. Panel members were Erwin Czerwinski, Nelson Pattern Co., Milwaukee; Augie Komar, Spring City Pattern Works Inc., Waukesha, Wis.; Leonard Licau, Allis-Chalmers Mfg. Co., Milwaukee; and Carl F. Jurack, Charles Jurack Pattern Co., Milwaukee.

Mr. Pfeiffer cited figures showing that some 400 foundries in the United States and Canada have closed since 1955, yet there is a need nationally and in Wisconsin for more patternmakers.

He mentioned that Allis-Chalmers currently has 22 apprentices in a 5-year course, which operates under the Wisconsin industrial law. Agreements with unions determine the number of apprentices in training at one time. Boys are admitted to the course from a waiting list of applicants and are on probation for 90 days. The apprentices work in the foundry alongside of experienced molders, patternmakers, and other shop people. The pay is enough to appeal to worthwhile boys.

Discussion developed that Wisconsin is one of the few states with a comprehensive industrial law, and it is looked upon favorably. It

Large and intricate cores are cured in minutes with the

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Elimination of oven baking speeds production ...cuts costs

Only a few minutes are required to cure green cores when the new sodium silicate-carbon dioxide process is used. Cores and molds are ready for the metal pouring line immediately after CO_2 curing. No time-consuming oven baking is required. The production cycle is faster . . . costs are lower.

In one foundry, six baking ovens were scrapped after the sodium silicate-CO_2 technique was given a trial. Another foundry reports that an overall cost saving of 21% has been achieved since switching from oven curing to the CO_2 process.

In addition, foundries using the new system find that CO_2-cured cores resist breakage, hot tears and cracks . . . can be made to extremely close tolerances. Foundry personnel like the new process because it has no toxic fumes or objectionable odors.

High-quality Du Pont sodium silicate is available in formulated products for CO_2 systems from foundry supply houses throughout the country.

Binder formulations vary for specific needs and foundrymen prefer to rely on the advice of their foundry supply representatives for recommendations.

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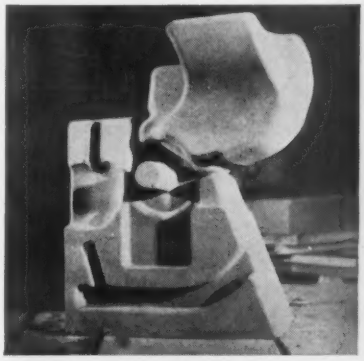
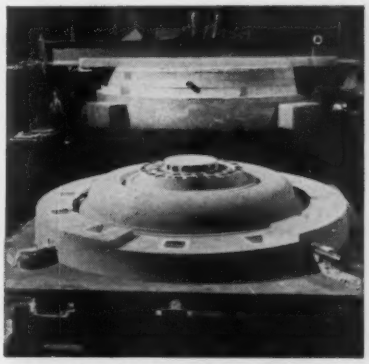
Fine core sand and a binder based on Du Pont sodium silicate are mixed thoroughly in a standard muller (left). Mixture is hand-tamped into form (right) then packed tightly with pneumatic rammer.

Core maker prepares to inject core with carbon dioxide (left). In the chemical reaction that results, the silicate is converted into a strong gel that binds sand grains together firmly. Cured core (right) is strong, yet will collapse easily after casting.





Intricate core for an automotive casting (left) is cured and ready for the metal pouring line in 2 to 3 minutes. Core for large industrial torque converter (right) is cured and ready for use in a few minutes. Oven curing would take several hours to do same job.

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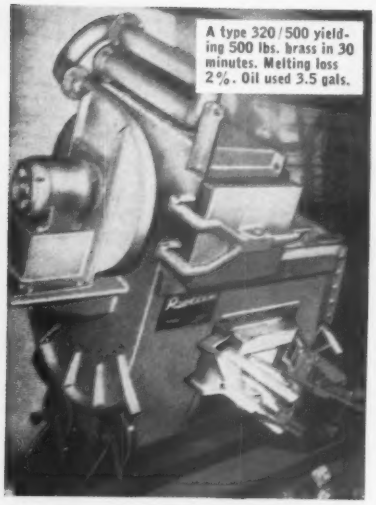
A type 320/500 yielding 500 lbs. brass in 30 minutes. Melting loss 2%. Oil used 3.5 gals.

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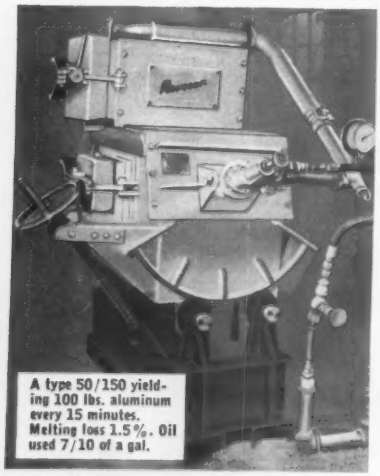
A type 50/150 yielding 100 lbs. aluminum every 15 minutes. Melting loss 1.5%. Oil used 7/10 of a gal.

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Circle 692 on Page 51

operates with full cooperation of industry, the apprentices and the unions, and it safeguards the interests of all.

Effect of Various Deoxidizers on Cast Steel, by Clarence E. Sims, Battelle Memorial Institute, Columbus, Ohio. Deoxidation is intended primarily to prevent porosity but its mechanics often are poorly understood. The mild deoxidizers carbon and hydrogen form gaseous products, and stronger deoxidizers are employed to prevent those elements from reacting during solidification. Strong deoxidizers are chemically active elements and may form stable sulfides, nitrides, and carbides as well as oxides. The side reactions of deoxidizers affect the type and distribution of nonmetallic inclusions, particularly sulfides, with resultant effects on mechanical properties.

Silicon and manganese are the great common deoxidizers, with manganese the most nearly indispensable one. Aluminum is the most useful strong deoxidizer. Special purpose strong deoxidizers are titanium, zirconium, and misch metal. Selenium is not a deoxidizer but sometimes is useful in improving ductility. Alkali and alkali earth metals are too volatile and insoluble in steel to be useful. Complex deoxidizers do not act differently than when added as separate components.

Solidification of Cast Steels and Practical Application of Exothermic Materials, by George Witt, Foundry Services Inc., Columbus, Ohio. Feeding of a casting is not a matter of riser volume alone, but the relationship of its volume to surface area. The closer that relationship approaches that of a sphere the more effective the feeding since the heat loss is least.

More effective feeding from risers, obtained by reducing the heat loss, may be accomplished by use of insulating material between the mold and the riser, or better by use of sleeves containing exothermic agents. Sleeves ignite in contact with the molten metal and burn slowly, supplying additional heat to the riser metal and providing more effective feeding. This additional heat permits an appreciable reduction in the size of the risers.

How Do You Handle Your Air-Arc Operations? Lloyd Olson, Bucyrus-Erie Co., South Milwaukee, indicated that 45 per cent of his firm's 90 to 100 tons per day production is treated by arc-air process for removal of riser pads, fins, etc. Castings weigh from ½ lb to 52,000 lb and include medium-carbon to high-alloy steels. Procedure is to shot blast, treat with arc-air, normalize, clean finish chip, weld, and finish grind. With higher alloy steels normalizing is done before arc-air treatment to reduce cracking tendency. Electrodes ½ and ⅝ in. are used with power supplied by rectifiers. Mr. Olson said arc-air procedure saved about 50 per cent as compared with swing grinding and chipping, amounting to $120,000 to $150,000 per year.

Stephen Kline, Crucible Steel Casting Co. Div., Consolidated Foundries & Mfg. Co., Milwaukee, said that about 60 per cent of the foundry's 1500 tons monthly production is subjected to arc-air processing for removal of riser stub and gate pad. Process also is used to remove imperfections in preparation for weld repair. Castings range from 1 to 16,000 lb in weight, with the average about 40 lb. Steels include carbon, low and high alloy types. Electrodes used are ⅜, ½, and ⅝ in. diam and power is supplied by motor-generator sets, with one rectifier unit for scarfing purposes only.

Arthur Hare, Grede Foundries Inc., Milwaukee, said his firm produces about 525 tons a month of carbon and low-alloy steel castings. Arc-air process is used to increase production and to eliminate chipping noise. It is used to remove fins from about 50 per cent of production and pads from about 25 per cent. Motor-generator sets supply power and ⅝ and ¾ in. electrodes are being used. Training of arc-air operators is important to obtain the best results. All speakers stressed the importance of adequate maintenance of equipment.

Hot Tears—a Major Casting Defect, by Charles Christopher, Continental Foundry & Machine Division, Blaw-Knox Co., East Chicago, Ind. He described an investigation of a large number of steels of widely varying composition made by the acid open-hearth, acid electric, and basic electric furnaces. The steels were heated to various temperatures, cooled rapidly, and subjected to microscopic examination to determine when melting occurred. It was found that carbon content determines the temperature at which melting takes place, specifically around 2650° F for 0.30 per cent C and about 2500° F for 0.90 per cent C steel.

Hot tears are attributed to stresses occurring in the particular temperature ranges. Trouble from hot tears may be overcome by head-

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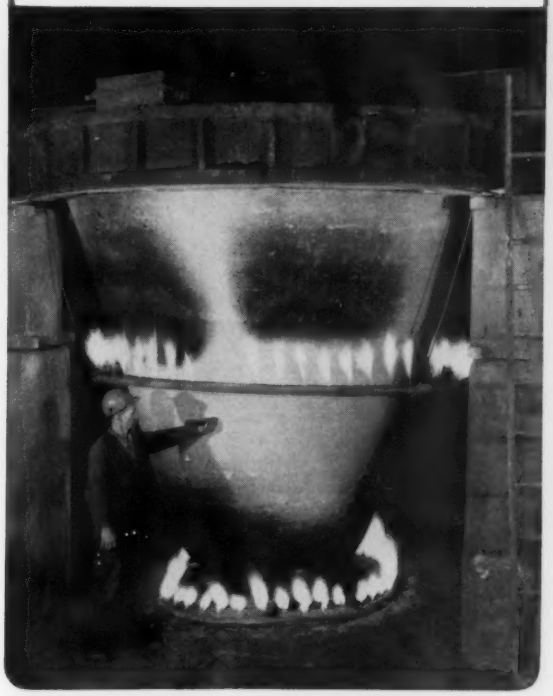

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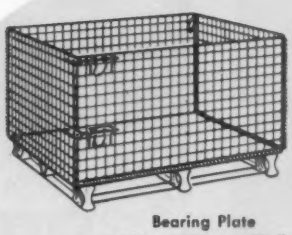

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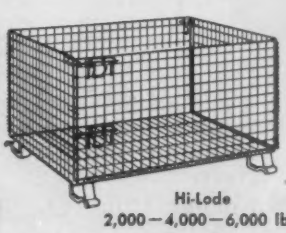

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ing, gating, and chilling systems which will avoid wide temperature differentials within the castings, and thereby minimize stresses.

Water-cooled Cupola Construction, Economics, Operation and Problems, by Mervin H. Horton, Deere & Co., Moline, Ill. He described initial and continuing work which resulted in present practice of watercooling the shell, and use of protruding, watercooled copper tuyeres. (River water is used on the shell cooling system, city water in the tuyeres.) Watercooled cupolas permit higher melting rates so that production requirements can be met on one shift instead of two. Refractory cost is reduced.

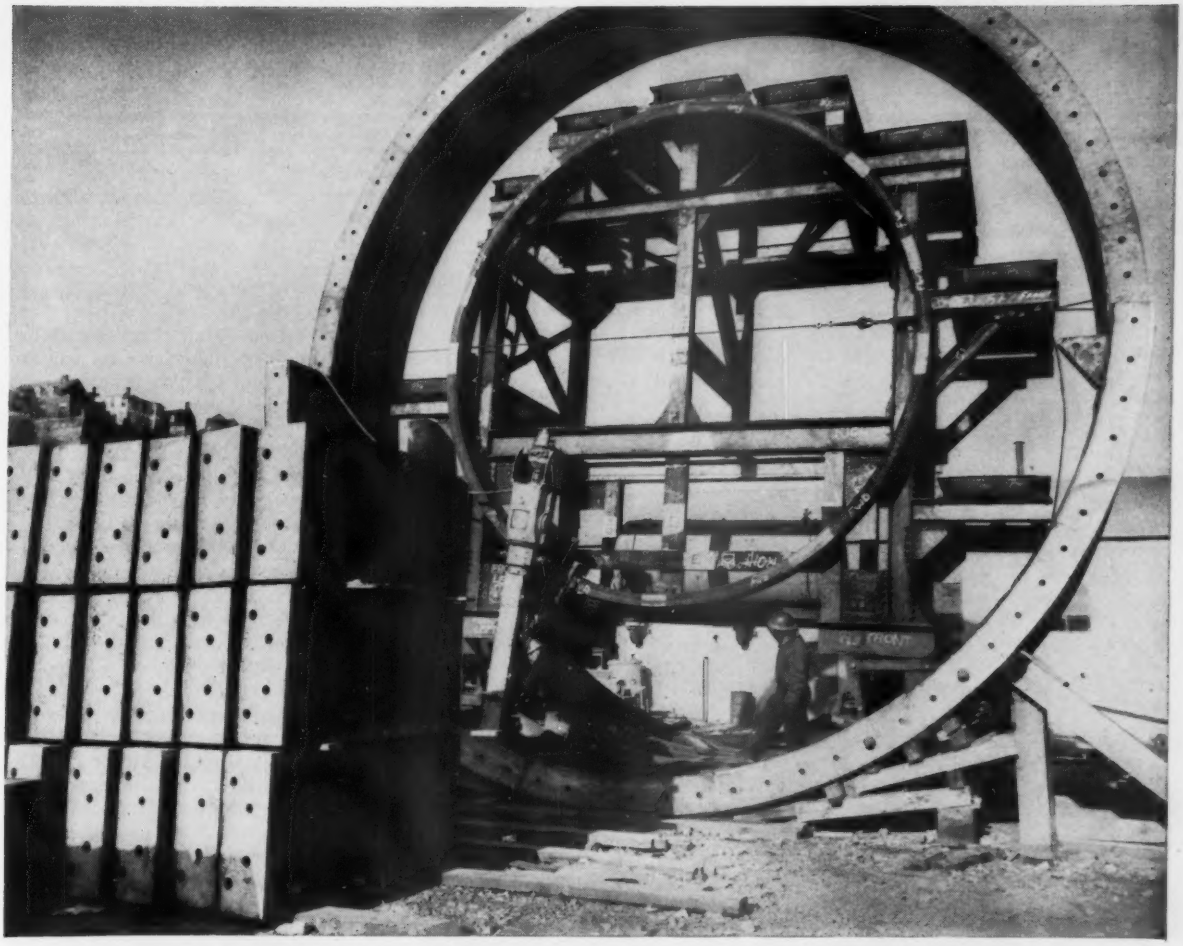
Molding — Nothing Has Been Changed, by Alexander D. Barczak, Superior Foundry Inc., Cleveland. He discussed the fundamental principles of molding and the various practices employed.

Mr. Barczak also presented in detail the various operations involved in hand and machine molding, pointing out that understanding of the principles required are necessary to produce good castings. Different types of molding machines and auxiliary equipment were illustrated by slides.

Gating of Gray Iron Castings, by John F. Wallace, Case Institute of Technology, Cleveland. The ideal gating system should 1) permit the mold to be filled rapidly, 2) prevent dross or sand from entering the cavity, 3) prevent aspiration of air or gases into the metal stream, 4) provide suitable thermal gradients, 5) give maximum casting yield and minimum grinding costs, and 6) provide for ease of pouring.

Horizontal gating systems which minimize metal and mold damage include a pouring basin, a tapered sprue choked at the bottom, a sprue well, large runners, and large ingates in the drag. Data have been given on fluidity. With this information and application of correct gating principles it is possible to select dimensions of a gating system that will fill the casting in the desired time and minimize aspiration, drossing, and turbulence.

Two luncheon sessions and the annual banquet completed the conference program. Carl Taylor, president, Waukesha State Bank, spoke on "Political Business" at the Thusday luncheon, and George G. Groman was the Friday luncheon speaker, explaining "How Other People Talk." Gov. Vernon W. Thomson of Wisconsin addressed the banquet on "Wisconsin Faces the Challenge of the Future."



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Around the Country

NEWS REPORTS FROM

Chicago . . . Pittsburgh . . . Detroit . . . Philadelphia . . . Boston

Detroit— Chrysler Corp.'s Detroit Foundry, formerly the Dodge Division foundry, 7900 Joseph Campau St., Hamtramck, is engaged in a $500,000 modernization program. A major portion of the program is in the coreroom where new sand mixing equipment, coremaking machines, ovens, and conveyors are being installed.

As a result of strict process control at American Foundry Co., Indianapolis, one of Chrysler's major casting suppliers, the annealing of gray iron transmission housings has been eliminated. The close control permits production of castings with constant properties and analyses. Machinability is said to be good.

In another Chrysler development, torsion bar anchors which originally had been made of welded tubing, then switched to forgings, now are being cast in pearlitic malleable iron by an outside supplier. Closer dimensional control is achieved. Full conversion to castings is, however, still in a trasitional period.

Recently, Cadillac Motor Car Division of General Motors Corp. started making a number of its smaller size patterns in molds faced with zircon sand. Molds are rammed slowly and firmly and are said to produce gray iron patterns to a tolerance of ±0.003 in. per in.

In the field of small car rumors, Ford Motor Co. reportedly has 19 drawings of front-drive cars and is now in the process of selecting a design which could be put through to production on a crash program for introduction in 1960. The engine for such a car is believed to be a four-cylinder model currently in development. Whether major cast parts in this engine are aluminum or gray iron is not definitely known, although some sources believe them to be aluminum and that the engine is a horizontally-opposed, pancake type.

Pontiac, according to a reliable source, will have cast pearlitic malleable crankshafts in its 1959 models. They will be cast in green sand molds, however, and not in shell molds as reported in FOUNDRY last month. Central Foundry Division of General Motors Corp. will produce them at its Danville, Ill., foundry starting in June.

Central Foundry Division also has developed an as-cast malleable iron which it calls Centra-Steel. Still in the development stage, it has shown as-cast properties approaching that of heat-treated malleable iron. The

6 ways to improve foundry efficiency

Photo courtesy Palmyra Foundry Co. Palmyra, New Jersey

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material, however, may not be ready for production applications for about a year.

Boston—Gray iron and malleable foundry operations will not increase to much over 50 per cent capacity through April. Steel pouring shops are going 10 to 15 points better than this, but backlogs are lower. Nonferrous foundries are also less active, although through first quarter this branch held up stronger than iron shops; valve and meter orders are down.

Of major industries using castings, heavy electrical equipment holds up best. General Electric Co., Lynn, Mass., has contracts totaling near $14 million for propulsion machinery and parts for eight nuclear-powered submarines. This supplements a substantial backlog of turbine and propulsion volume for ships and power plants.

Machine tool industry is slow in New England. Although some new orders for tooling for small automobile models are coming through, foundries will not benefit much for some weeks. Paper and pulp mill demand for castings has slumped while melt at textile mill equipment shops is unchanged—50 to 60 per cent capacity. Gray iron shops doing better than three days per week are the exception and most are not pouring full heats at that rate.

Jobbing shops are meeting sharp competition from captive foundries, notably those in the textile equipment industry. Most of the latter are mechanized and have sizable capacity.

Philadelphia—Foundrymen are still hopeful of a spring upturn. Some improvement is noted in building and highway construction, and foundrymen are encouraged by reports of some betterment in machine tool orders. However, little of this has yet been reflected at the foundry level and casting demand generally remains dull.

Gray iron and nonferrous shops are operating at around 50 per cent (no change over recent weeks); steel foundries are at 50 to 60 per cent; and malleable foundries are at around 80 per cent.

With virtually no backlogs, gray iron and brass and bronze jobbers can make prompt shipments. The light metal shops appear in a little stronger position, as also are steel foundries, although their backlogs have been shrinking steadily, despite ship work and a fair amount of heavy industrial machinery requirements. Steel casting consumers claim they can almost name their delivery date—that is, within reason. Some say they have no trouble getting shipments within two weeks.

Malleable job shops have fairly extended backlogs. Plants specializing in small castings, for hardware and electrical equipment applications, appear to be in stronger position than most. Producers of malleable pipe fittings are running moderately well for stock.

Gray iron jobbers are operating at around three to four days a week or operating alternate weeks—mostly with reduced forces. Work is diversified, with electrical equipment requirements perhaps the most active. Paper machinery needs show some improvement. Industrial gas and material handling equipment specifications are fair. Textile machinery requirements are poor.

Nonferrous captive shops, engaged in the production of such items as meters, industrial valves ,and pumps, are running at a moderate rate but have no overflow for the independent shops. In fact, some captive foundries are competing with the in-

You get superior curing of shell molding materials with Heyden Newport technical grade Hexamethylenetetramine. It's available in three forms to suit your requirements —Granular, Powder and Flo Powder.

Hexa Granular is readily milled into the phenolic resin and is easily dissolved for liquid processes. Heyden Newport's Hexa Flo Powder is non-caking and disperses rapidly and uniformly.

For further information on the advantages and applications of Heyden Newport Hexamethylenetetramine call or write today. Wherever your plant is, you can rely on prompt deliveries from strategically located Heyden Newport warehouses. Heyden Newport Chemical Corporation, 342 Madison Avenue, New York 17, N.Y.

HEYDEN NEWPORT *Where tradition meets tomorrow in chemical progress*

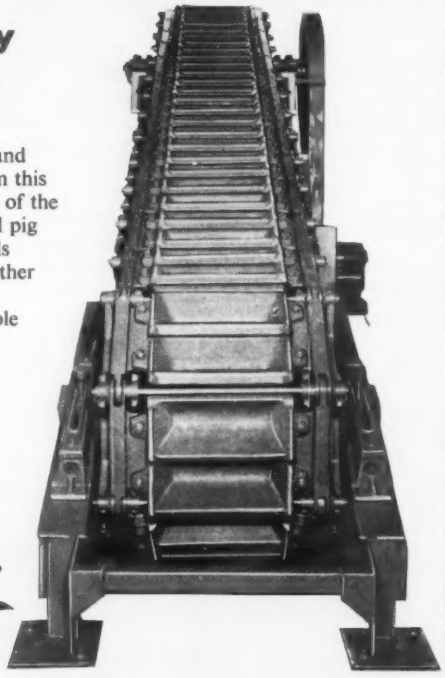
Circle 697 on Page 51

CONTINUOUS OPERATION

For Foundry Pig Casting

Sharply reduced down-time and maintenance costs result from this design which eliminates 80% of the moving parts of conventional pig casting machines. Idler wheels are mounted on the frame rather than on the moulds, thus keeping them as far as possible from the hot metal.

Bailey Pig Casting Machines are made in capacities from 3 to 50 tons per hour. Sizes: 15 to 125 feet, in multiples of 5 feet.



Bailey

PIG CASTING MACHINES

dependent plants for outside tonnage. All this makes the going rough for the job shops which also report a particularly disappointing volume of work in the plumbing lines.

Pittsburgh—Mill operations continue to hold at about 55 per cent of capacity, resulting in restricted purchases of castings. Foundries supplying ingot molds report sales remain slow. Automotive demand is also light. Despite sluggishness in casting sales, demand for foundry equipment has not dropped in proportion.

Several capital equipment makers reported fairly good backlogs last month. Mesta Machine Co.'s unfilled orders in early 1958 totaled $76 million, compared with $79.3 million a year earlier. Blaw-Knox Co.'s backlog dropped by 7 per cent, to $143 million.

One mill equipment producer explains, "Some of our backlog consists of orders placed in late 1956 and early 1957. In addition, we are furnishing repair parts for a large number of mills built within the past year. Currently, incoming orders are well below year-ago levels. We are filling a number of small orders, but there are few major contracts being placed now."

Chicago—The proposed air pollution ordinance introduced in Chicago City Council on Jan. 17 and now being studied by the Building and Zoning and Health committees specifies that "cupolas shall be equipped with gas cleaning devices and/or so operated as to reduce the content of particulate matter emitted into the atmosphere to not more than 0.50 grains per standard cubic foot of gas based on stack gas volume corrected to 60° F and 30 inches of mercury."

It is also specified that cupolas contracted for, under construction, or in operation prior to adoption of the ordinance shall comply with the foregoing provisions within 10 years from the date of adoption.

It is stated that "air furnaces shall be so operated that smoke of an appearance, density, or shade in excess of No. 2 of the Ringelmann Chart shall be prohibited except that No. 3 smoke shall be allowed for a period or periods aggregating not more than 6 minutes in any 60-minute period." (The Ringelmann Chart, illustrates graduated shades of gray to black for use in estimating the light obscuring capacity of smoke.)

Emission of particulate matter by air furnaces and heating and reheating furnaces is spelled out in a de-

Circle 698 on Page 51
Circle 699 on Page 51→

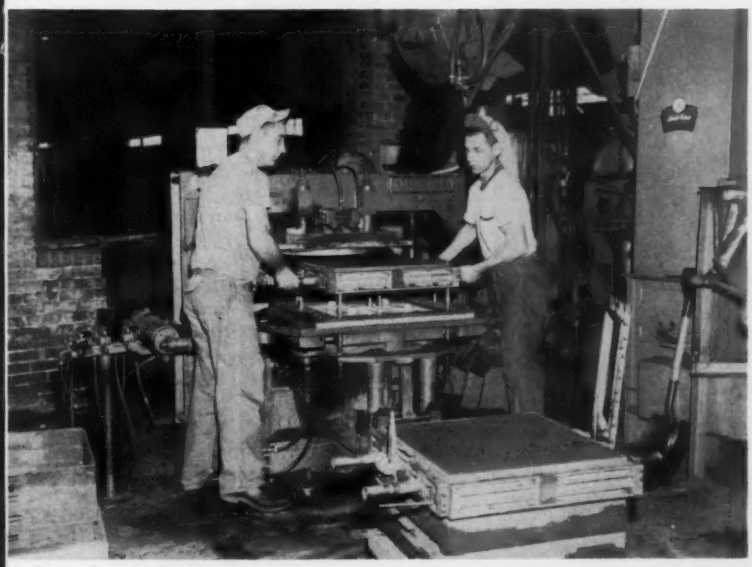
ANOTHER

NEW INTERNATIONAL

SK20

Jolt-Squeeze-Drop Strip or Pin Push Up

or Drop Strip Roll On - Roll Off



Here is a new machine, designed for larger requirements, incorporating sound engineering features, that can be made with

any size jolt

any size squeeze

any size draw

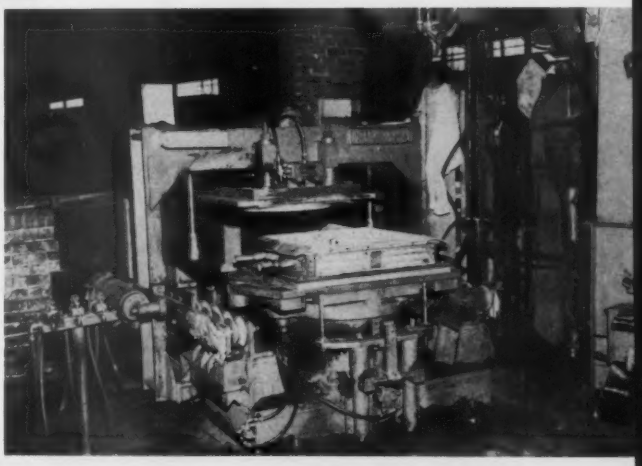
for any size job.

The SK20 illustrated has 20" squeeze cylinders, an 8" jolt cylinder, and is designed as a multiple molding machine—with a 4" draw. Picture shows hand control valves. It can also be furnished with partial or completely automatic control cycle.

Photos Courtesy of
PHILCO CORPORATION - Dexter Foundry Division - Fairfield, Iowa

Operational Features of the SK20

- ★ Head moves out – away from table of machine for easy loading of sand and flask.
- ★ Head moves in – Large V guides insure proper alignment of head over table for accurate and square, uniform squeeze – and true draw.
- ★ Two large cylinders control the movement of the head with oversized deceleration valves for cushioning.
- ★ Can be loaded from front – side – or rear.



The INTERNATIONAL LINE is designed by experienced foundry engineers who have a practical working knowledge of the problems of the industry.

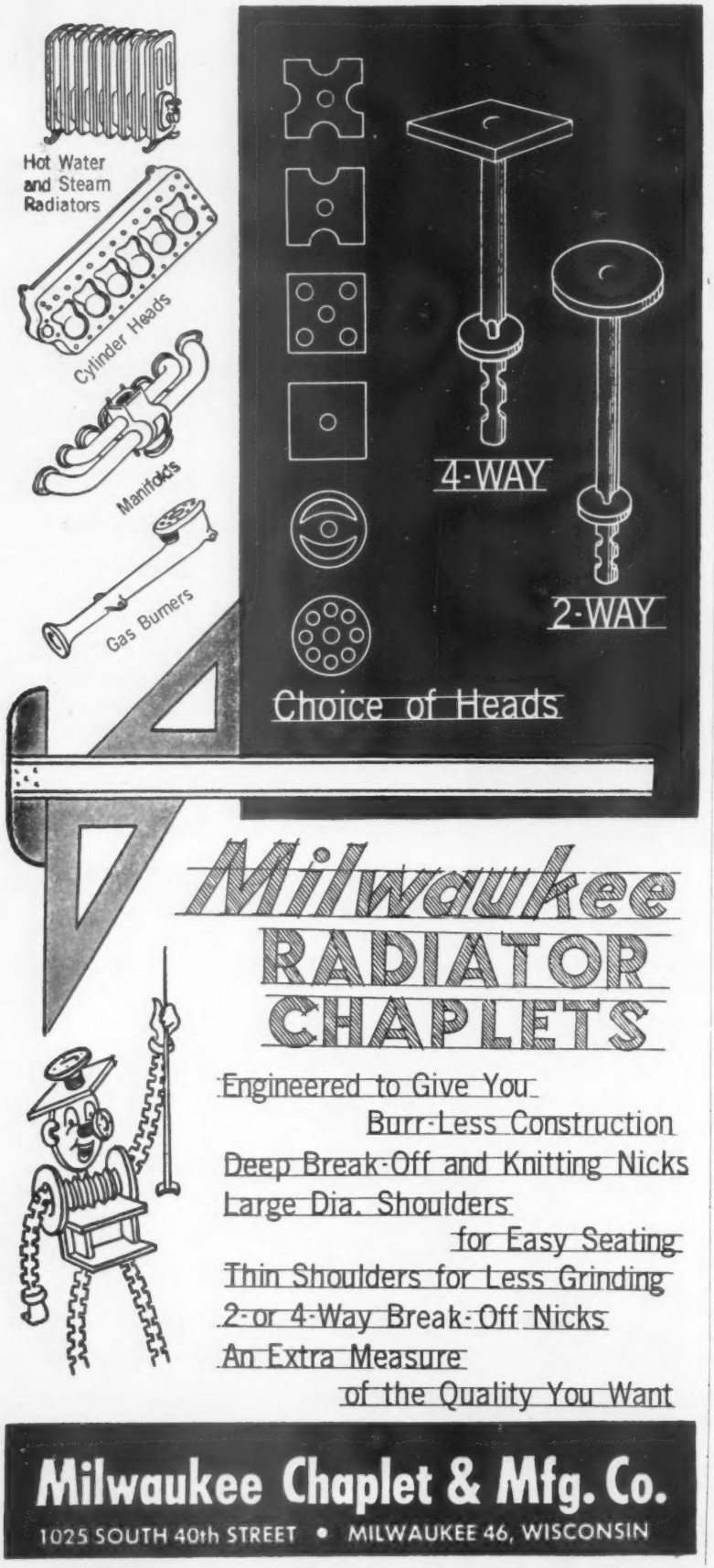
Write, telling us your particular needs.

We will forward complete information and suggestions.

by INTERNATIONAL

MOLDING MACHINE COMPANY

LAGRANGE PARK, ILLINOIS



tailed section of the proposed ordinance. In this section it is stated that all existing coal burning combustion equipment shall meet the limitations set forth within 5 years from effective date of the ordinance adoption.

* * *

Marking its 21st year of service to industry and government, Armour Research Foundation of Illinois Institute of Technology, Chicago, conducted a record 734 research programs during 1957 with a gross volume of more than $14 million, an 18 per cent increase over the previous year.

In foundry research, a combination of press forging with casting was the scope of a project sponsored by the Manufacturing Methods Branch of the U. S. Air Force Air Materiel Command. This procedure, it is reported, led to local improvement of the mechanical properties of cast parts.

Deformations of 20 per cent on aluminum 220 alloy increased the yield strength by 67 per cent and the ultimate tensile strength by 43 per cent with 7 per cent elongation. Magnesium alloy AZ 92 responded with an increase of 43 per cent in yield strength and 19 per cent in ultimate strength with no loss in ductility. The process was proved by use on a production aircraft casting.

Training & Research Institute Offers Regional Courses

The technical training program of the Training & Research Institute of American Foundrymen's Society recently took a step toward fulfilling one of its objectives when it offered two regional technical courses for upgrading foundrymen. These courses were presented on "Cupola Melting of Iron" and were given at Berkeley, Calif., Feb. 10-12, and at Hamilton, Ont., March 17-18.

Courses in the 1958 series have been expanded to include 14 subjects, with 17 separate offerings. Most courses are offered in the Midwest, but others also will be given in different areas where the demand exists. Additional courses for these areas will be developed as the need arises.

Course S23A, "Sand Control and Technology," will be presented Aug. 11-15 rather than Aug. 4-8, as originally announced (FOUNDRY, March 1958, pp. 176 and 178). The change was required to avoid a conflict with a meeting of the national board of directors of AFS.

this is the DYNAMIC FOUNDRY INDUSTRY . . .

Value of foundry industry production is at an all time high of over $6½ billion, as shown in the table below. Because of its end-product system of classifying plants, the U.S. government includes in its foundry SIC groups only the "jobbing" foundries—the 3,650 plants which produce castings for resale. However, the dynamic foundry industry is bigger than SIC figures indicate. It also embraces the 2,000 "captive" foundries operated by companies that make castings for their own use. The annual buying power of *all* castings producers, both jobbing and captive foundries, exceeds 2½ billion dollars for equipment, materials and supplies. Industry figures presented here are based on the 1954 Census of Manufacturers, and estimates by Sales Management and FOUNDRY's market research department.

SIC Code	Industry Title	Value Of Products Shipped		Employment	
		1954	1956	1954	1956
3321	Gray iron foundries (jobbing)	$1,419,000,000	$1,810,000,000	133,900	150,000
	Gray iron foundries (captive)	1,167,000,000	1,339,000,000	74,400	80,400
	Total-Gray Iron foundries	**2,586,000,000**	**3,149,000,000**	**208,300**	**230,400**
3322	Malleable foundries (jobbing)	212,000,000	265,000,000	23,400	27,100
	Malleable foundries (captive)	169,000,000	187,000,000	12,200	13,100
	Total-Malleable foundries	**381,000,000**	**452,000,000**	**35,600**	**40,200**
3323	Steel foundries (jobbing)	535,000,000	925,000,000	55,100	70,000
	Steel foundries (captive)	186,000,000	257,000,000	15,300	21,000
	Total-Steel foundries	**721,000,000**	**1,182,000,000**	**70,400**	**91,000**
3361	Nonferrous foundries (jobbing)	874,000,000	1,127,000,000	73,500	83,800
	Nonferrous foundries (captive)	560,000,000	681,000,000	39,600	47,400
	Total-Nonferrous foundries	**1,434,000,000**	**1,808,000,000**	**113,100**	**131,200**
FOUNDRY INDUSTRY TOTAL		**$5,122,000,000**	**$6,591,000,000**	**427,400**	**492,800**

How FOUNDRY can help you get more business from the rich, growing metal-casting market

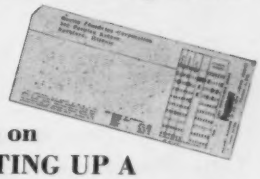
1 Help on ANALYZING THE MARKET

Tells you where *every* foundry in the U. S. and Canada is located . . . describes each one in detail. Revised every two years, Penton's Foundry List keeps you up-to-date on *changes* that take place . . . helps you know who and where to sell. Available at moderate cost.

2 Help on EVALUATING PERFORMANCE AND POTENTIALS

A "Foundry Industry MARKETING GUIDE" identifies the 96 primary trading areas ranked by productive capacity. Permits a quick, accurate check of your sales performance and potentials by territories . . . pinpoints market potentials.

3 Help on SETTING UP A SALES CONTROL PLAN



Sales Control Cards tailor-made to your sales and territory requirements give your salesmen "blue ribbon" prospect lists. Essential information is coded on punch cards for your use in direct mail, sales analysis, personal selling. Available at moderate cost.

4 Help on MAKING YOUR DISTRIBUTION MORE EFFECTIVE

A system for improving or starting an effective distribution setup to cover the foundry industry. This list of supply houses and agents gives locations and necessary information . . . classified advertising in FOUNDRY often backs up this service.

5 Help on PROMOTION AND MERCHANDISING PROGRAMS

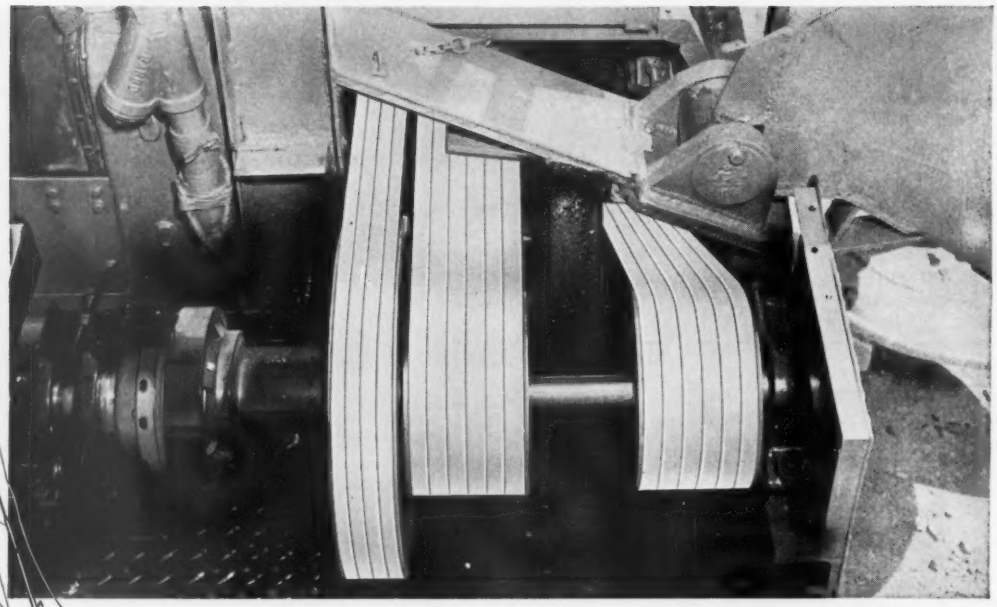
Advertising in FOUNDRY is backed, on request, by a complete merchandising program including ad and editorial reprints, a regular newsletter "CONTACT", even personal letters to kick off a campaign. It is aimed at your customers and prospects as well as your own salesmen and distributors, should you wish to use this service.

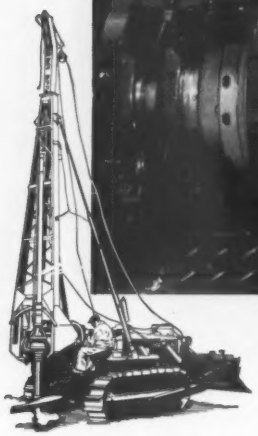
. . . and you do more business with foundries when you advertise in . . .

FOUNDRY

NDP BPA

a PENTON *Publication / Penton Building • Cleveland 13, Ohio*

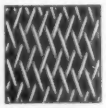




Super V-Belts soak up shock ...cut maintenance costs 50%

No other V-Belt has ALL these advantages

1. Flex-Weave Cover (U. S. Pat. 2519590)



A Gates exclusive: provides greater flexibility . . . prolongs belt life . . . helps deliver more power to driven machine.

2. Concave Sidewalls (U. S. Pat. 1813698)

Note the concave sides shown in Fig. 1. As belt bends, concave sides become straight, making uniform contact with sheave groove (Fig. 1-A). Even contact means uniform wear . . . far longer belt life.

3. Tough, resilient Tensile Cords

Super strong and resilient; provide 40% greater horsepower capacity . . . easily absorb heavy shock loads . . . reduce number of belts required, save weight and space.

4. High Electrical Conductivity

Built into Gates Super Vulco Ropes for safer drives (in explosive atmosphere).

5. Oil, Heat, Weather Resistant

Made with special rubber compounds, Super Vulco Ropes stand up longer under all conditions.

ESPECIALLY DESIGNED to handle the heaviest shock loads, Gates Super Vulco Ropes insure lower replacement and lower maintenance costs.

For example: Sordoni Construction Co., Inc., Forty-Fort, Pa., had frequent trouble with the drive on their heavy-duty hole-digger and pole-setter when installing big 80-foot powerline poles.

Lambert Swingle, shop superintendent, and the nearby Gates Field Engineer designed the drive for the equipment shown here. Mr. Swingle says: "The Gates Super Vulco Rope Drive has been working perfectly since 1956, cutting maintenance costs 50%. Without Gates Ropes, we'd be down most of the time."

A wealth of drive data is quickly available to you. Simply call your nearby Gates distributor for a Gates V-Belt specialist. Stocks carried in industrial centers around the world.

The Gates Rubber Company

Denver, Colorado

World's Largest Maker of V-Belts

Gates

Gates Super VULCO ROPE Drives

40% more Horsepower Capacity

TPA 314

Circle 702 on Page 51

Foundry Statistics

ALUMINUM

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1955	827,162	165,482	298,349	355,203	.....
1956					
Dec.	66,951	13,405	20,557	32,940	118,185
Total	794,581	171,181	245,421	376,230	.....
1957					
Jan.	72,999	14,201	20,963	37,194	116,088
Feb.	69,451	13,366	21,707	34,311	107,869
Mar.	74,527	13,914	22,974	37,521	107,963
Apr.	68,284	14,287	20,376	33,493	98,113
May	65,108	12,705	20,708	31,602	94,748
June	58,547	11,585	17,180	29,700	88,086
July	52,173	10,447	16,322	25,339	89,430
Aug.	55,735	10,996	18,398	26,319	89,826
Sept.	58,692	11,367	17,820	24,900	93,720
Oct.	64,140	11,570	20,543	31,936	91,817
Nov.	58,898	10,411	18,611	29,793	91,860
Dec.	53,102	9,302	16,724	26,978	86,323
Total	751,656	144,151	232,326	369,086	.....

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments		Standard		Pearlitic		Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	
1955	1,104,775	652,552	.....	.....	.....	.....	.....
1956							
Dec.	76,352	44,268	63,625	37,569	12,727	6,699	92,311
Total	951,868	557,636	812,905	466,845	138,963	78,073	.....
1957							
Jan.	85,977	51,508	71,689	43,401	14,288	8,107	93,886
Feb.	78,028	46,729	65,411	39,590	12,617	7,139	90,725
Mar.	78,013	48,311	64,560	23,915	13,453	7,666	89,431
Apr.	80,271	51,320	65,990	42,810	14,281	8,510	83,116
May	76,504	46,277	63,058	38,072	13,445	8,205	79,787
June	72,556	44,639	59,829	36,892	12,727	7,747	76,331
July	57,748	34,876	45,101	27,290	12,648	7,586	80,694
Aug.	65,426	39,644	55,320	33,781	10,106	5,863	84,876
Sept.	62,457	38,397	52,281	31,658	10,176	6,739	83,385
Oct.	77,667	45,989	66,043	39,269	11,624	6,720	82,995
Nov.	67,904	38,085	55,564	31,036	12,340	7,049	80,074
Dec.	60,425	34,343	48,694	27,218	11,731	7,125	74,863
Total	862,976	520,118	713,540	414,932	149,436	88,356	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1955	1,008,998	905,867	63,111	.....
1956				
Dec.	65,197	57,931	3,769	56,556
Total	966,306	866,545	57,522	.....
1957				
Jan.	82,025	73,202	4,510	57,422
Feb.	72,084	64,346	4,188	54,133
Mar.	77,418	69,258	4,445	49,135
Apr.	77,167	69,141	4,316	48,148
May	75,347	67,251	4,421	46,791
June	70,959	63,910	3,590	44,232
July	60,621	54,847	3,010	44,175
Aug.	71,233	64,953	3,278	40,446
Sept.	70,804	64,470	3,243	40,298
Oct.	81,836	74,391	3,693	39,063
Nov.	70,187	63,944	3,006	34,249
Dec.	65,708	59,606	3,046	31,509
Total	875,389	788,319	44,696	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1955	27,854	25,294	....
1956			
Dec.	2,794	2,612	7,616
Total	36,168	33,580	....
1957			
Jan.	3,207	3,017	8,245
Feb.	2,661	2,473	8,276
Mar.	2,970	2,804	7,690
Apr.	2,896	2,723	7,542
May	2,832	2,706	7,188
June	2,973	2,817	6,765
July	2,544	2,384	6,964
Aug.	2,315	2,150	6,222
Sept.	2,279	2,071	5,705
Oct.	2,192	2,093	5,318
Nov.	1,920	1,806	4,802
Dec.	1,533	1,408	4,823
Total	30,322	28,452	....

PRODUCTION WORKERS

Estimated Number

	Dec. 1957	Nov. 1957	Avg. 1957
Ferrous	186,500	187,500	196,400
Nonferrous	58,400	60,500	63,900

Average Weekly Earnings

Gray Iron	83.93	83.18	84.15
Malleable Iron	86.69	85.57	84.63
Steel	94.17	91.63	95.88
Nonferrous	90.48	90.94	91.60

Average Weekly Hours

Gray Iron	37.3	37.3	38.6
Malleable Iron	38.7	38.2	39.0
Steel	39.4	38.5	40.8
Nonferrous	39.0	39.2	40.0

Source: Bureau of Labor Statistics.

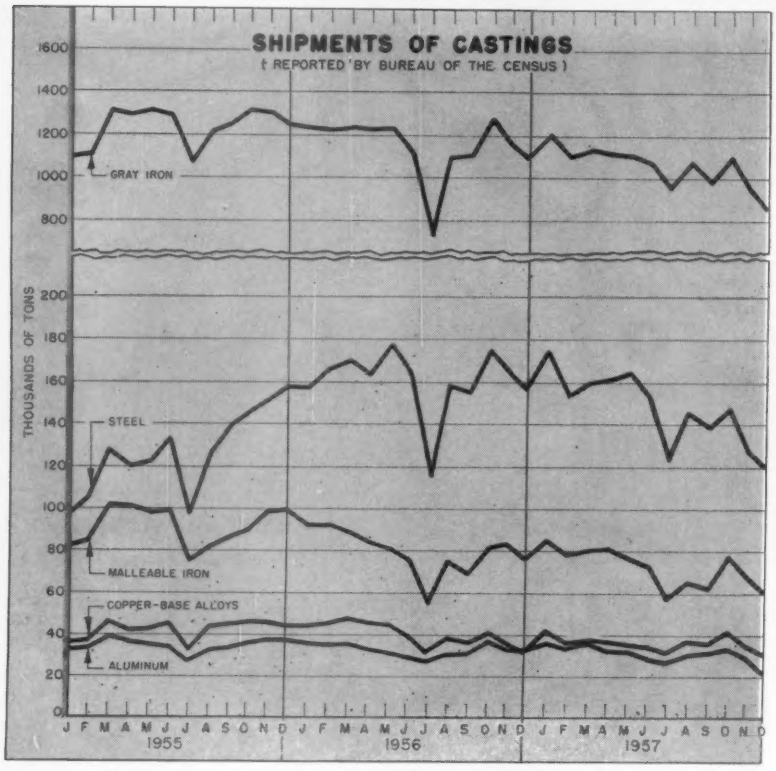
GRAY IRON CASTINGS—SHIPMENTS (Net tons[1])

	All Castings		Miscellaneous Castings		Nodular Iron Castings	Heavy Steel Ingot Molds	Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	Total	Total	Total[3]	Total[3]	
1955	14,837,745	7,987,205	9,161,685	3,715,963	.....	2,739,864	385,041	1,681,630	869,558	.....
1956										
Dec.	1,108,993	587,046	681,834	281,527	.....	254,703	25,874	92,439	54,143	920,034
Total	13,860,527	7,963,135	8,265,526	3,650,735	.....	2,624,146	406,191	1,746,902	817,762	.....
1957										
Jan.	1,213,215	642,317	761,697	320,058	.....	261,961	31,139	101,069	57,346	904,860
Feb.	1,103,118	582,010	705,585	302,514	.....	230,126	30,079	89,146	48,182	931,054
Mar.	1,133,146	604,481	713,767	305,104	.....	214,775	36,995	108,158	59,451	934,847
Apr.	1,120,349	611,443	699,395	298,319	.....	192,199	36,979	128,710	63,066	899,074
May	1,112,096	625,496	674,460	291,557	11,206	192,336	34,406	141,685	69,209	879,825
June	1,058,464	599,494	630,513	274,115	10,207	193,640	32,087	131,360	70,864	853,012
July	954,102	523,489	565,897	243,187	10,901	190,434	31,209	106,532	60,030	825,676
Aug.	1,075,957	596,779	630,130	265,185	10,339	205,655	28,976	238,209	72,987	825,676
Sept.	990,139	563,477	579,444	259,649	10,253	202,911	23,681	119,689	64,411	805,301
Oct.	1,099,554	601,109	668,895	282,024	11,974	210,521	26,306	122,149	71,683	740,169
Nov.	940,138	482,732	599,292	242,847	10,601	166,652	24,302	91,138	58,754	704,623
Dec.	864,226	443,670	557,154	226,356	9,810	148,074	23,173	73,500	62,325	675,838
Total	12,664,504	6,877,497	7,786,229	3,310,915	.....	2,409,284	359,332	1,451,345	758,308	.....

STEEL CASTINGS—SHIPMENTS (Net tons[1])

	All Castings			Carbon			Alloy			Unfilled Orders[2]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1955	1,530,694	1,166,706	236,880	1,088,489	814,258	219,602	445,769	354,452	17,278	.....
1956										
Dec.	158,725	125,569	34,080	120,326	94,741	32,227	38,399	30,828	1,853	521,782
Total	1,931,987	1,512,290	368,918	1,444,768	1,122,109	345,091	487,219	390,181	23,827	.....
1957										
Jan.	169,240	133,826	30,090	125,389	98,533	27,739	43,851	35,293	2,351	519,575
Feb.	154,932	121,667	27,181	114,805	89,480	25,060	40,127	32,187	2,121	511,806
Mar.	160,054	124,416	29,968	121,089	93,466	27,683	38,965	30,950	2,285	503,407
Apr.	162,498	124,549	29,708	122,894	93,512	27,624	39,604	32,037	2,084	497,632
May	164,575	125,431	32,840	124,840	94,635	30,926	39,735	30,796	1,914	504,990
June	153,647	119,353	31,338	116,759	91,009	25,766	36,888	28,344	2,572	494,267
July	122,018	90,037	22,803	91,730	67,719	21,426	30,288	22,318	1,377	489,390
Aug.	145,926	111,080	33,641	113,167	86,407	31,639	32,759	24,673	2,002	471,190
Sept.	139,002	105,611	29,718	106,261	80,871	27,885	32,741	24,740	1,863	438,510
Oct.	146,397	113,216	31,477	110,100	85,144	29,320	36,297	28,072	2,157	395,907
Nov.	127,115	98,436	26,892	93,343	71,846	25,105	33,772	26,590	1,787	362,948
Dec.	120,787	92,125	23,403	88,101	66,468	21,808	32,686	25,657	1,595	327,337
Total	1,766,281	1,359,747	349,059	1,328,478	1,019,090	324,951	437,313	342,854	24,108	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.



COKE PRODUCTION AND CONSUMPTION

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1955 ...	75,301,826	76,400,385	3,154,632
1956			
Dec. ...	6,845,064	6,959,900	224,452
Total .	74,454,264	73,814,941	2,856,395
1957			
Jan. ...	6,859,657	7,098,041	241,478
Feb. ...	6,213,577	6,304,315	229,749
Mar. ...	6,895,077	6,804,267	233,176
Apr. ...	6,436,259	6,396,886	227,609
May ...	6,631,807	6,521,105	220,063
June ...	6,361,611	6,317,615	188,877
July ...	6,501,595	6,375,616	180,698
Aug. ...	6,519,973	6,401,949	206,907
Sept. ...	6,296,519	6,186,475	199,226
Oct. ...	6,275,567	6,120,485	208,720
Nov. ...	5,615,746	5,425,296	199,052
Dec. ...	5,164,965	5,099,556	173,470
Total .	75,772,353	74,961,606	2,509,025

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1957	1958
Jan.	25,681	20,468
Feb.	20,769	.....
Mar.	21,948	.....
Apr.	23,507	.....
May	22,037	.....
June	18,888	.....
July	16,695	.....
Aug.	19,654	.....
Sept.	19,670	.....
Oct.	22,800	.....
Nov.	19,767	.....
Dec.	16,875	.....
Total for year	248,291	.....

Source: Defense Council of the Ingot Brass and Bronze Industry.

ZINC-BASE ALLOYS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1955	778,000	493,244	.....
1956			
Dec.	58,583	36,562	75,293
Total ..	693,728	449,516	.....
1957			
Jan.	67,964	42,189	75,503
Feb.	59,793	36,580	74,739
Mar.	61,378	40,593	64,466
Apr.	54,982	34,801	59,534
May	53,565	35,676	66,712
June	49,356	33,206	64,137
July	48,379	29,418	64,043
Aug.	49,829	34,040	64,789
Sept.	47,736	33,838	68,122
Oct.	62,332	39,990	69,275
Nov.	58,689	35,005	63,665
Dec.	49,597	29,998	58,792
Total ..	663,600	425,334	.....

INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1956	1957
Jan.	195.6	117.9
Feb.	169.0	188.4
Mar.	152.7	127.0
Apr.	135.2	101.1
May	207.0	136.2
June	156.7	187.5
July	110.3	98.6
Aug.	188.3	231.3
Sept.	114.7	113.9
Oct.	122.2	145.3
Nov.	121.0	59.6
Dec.	115.6	61.4

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent monthly average. This is a new base period. Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	By Types of Furnace: Cupola Total	Air Total	Electric Total
1955	72,654,925	10,786,957	1,273,470	8,757,593
1956				
Nov.	6,305,947	822,542	95,890	875,524
11 mo. ..	65,444,534	9,094,976	1,051,268	9,011,117
Dec.	6,264,955	722,320	82,160	851,770
Total	71,709,489	9,817,287	1,133,128	9,862,887
1957				
Jan.	6,630,804	874,764	102,782	927,499
Feb.	6,038,436	804,185	93,902	834,843
Mar.	6,294,038	814,372	92,534	903,149
Apr.	5,816,309	835,027	97,289	807,922
May	5,753,435	812,141	92,260	786,210
June	5,430,607	744,790	80,063	705,590
July	4,897,752	652,773	68,504	629,395
Aug.	5,299,543	765,877	81,941	759,517
Sept.	5,033,998	721,125	82,948	672,597
Oct.	5,333,767	817,338	91,766	718,791
Nov.	4,858,489	716,095	72,871	589,879
11 mo. ..	61,407,178	8,558,487	956,860	8,334,392

PIG IRON PRODUCTION AND CONSUMPTION

	Production** (Standard grades—net tons) Total	Foundry	Malleable & Silvery	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace—gross tons) Total	Cupola	Air	Electric
1956	75,301,134	2,402,861	3,733,258	61,900,276	7,264,761	60,571,150	4,419,655	242,144	190,386
1957									
Jan.	7,209,547	135,608	344,073	6,081,137	648,699	6,482,472	423,660	22,989	20,431
Feb.	6,596,133	154,543	294,491	5,414,732	730,794	5,860,099	369,206	20,743	19,443
Mar.	7,179,100	168,650	347,451	6,008,135	654,864	6,155,334	370,915	20,241	23,259
Apr.	6,810,102	162,023	329,150	5,686,507	632,392	5,586,587	369,359	20,495	19,756
May	6,877,052	258,638	313,583	5,720,212	584,619	5,862,966	362,085	19,201	17,869
June	6,593,326	243,789	318,906	5,436,203	594,428	5,672,086	335,574	17,044	17,744
July	6,625,901	221,929	336,590	5,515,736	551,646	5,558,702	306,119	14,735	17,992
Aug.	6,719,763	228,378	298,269	5,451,691	741,425	5,769,995	349,988	17,540	25,948
Sept.	6,569,074	218,297	292,244	5,272,056	786,477	5,645,036	321,728	17,084	28,638
Oct.	6,454,450	164,944	303,104	5,390,851	595,551	5,669,624	354,364	18,466	24,691
Nov.	5,711,242	153,722	290,547	4,759,255	507,718	5,073,898	309,674	14,886	17,199
Dec.	5,212,624	165,268	228,897	4,394,869	423,590	.....	.....	.....	.....
Total ...	78,557,011	2,275,789	3,697,335	65,131,684	7,452,203	.....	.....	.....	.....
1958									
Jan.	4,785,269	100,097	232,802	4,036,511	415,859	.....	.....	.....	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

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Foundry Group Meetings

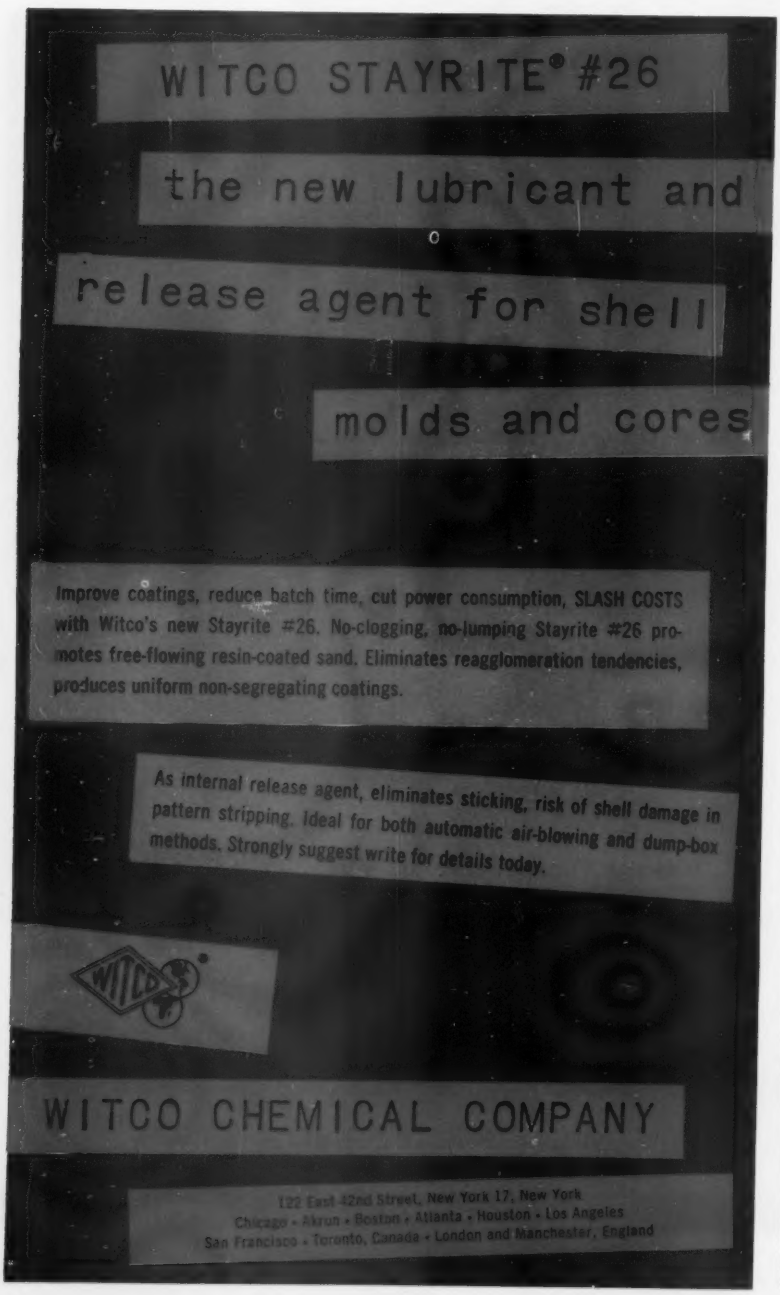
Cleveland Non-Ferrous — "Effecting Economies on Reduced Operations" was discussed by 30 members of the Non-Ferrous Founders' Society chapter at its Feb. 27 meeting in the Cleveland Athletic Club. After a short introduction by W. A. Gluntz, Gluntz Brass & Aluminum Foundry Co., a panel including Mr. Gluntz, W. A. Gluntz Jr., U. F. von Rosen, Soloway & von Rosen accounting firm, and E. J. Metzger, Multi-Cast Corp., Wauseon, Ohio, answered questions from the group.

Discussion centered on ways to reduce fixed and variable costs. It was pointed out that the current low business level period is a good time to reduce scrap because time is available to study each job critically and improve processes and quality control.

Some foundries have had good co-operation from supervision and production workers in raising efficiency by keeping them informed on the companies' problems and general industry conditions. Others have found difficulty in getting workers to produce above 100 per cent rating because they try to stretch the work.

On the question of how to quote castings prices in a changing metal market it was agreed that it is best to quote at the current price, then deliver on that basis. It also was pointed out that profit should be based on conversion cost (fixed cost plus processing) excluding metal cost. After profit is determined and added in, then metal cost is added to arrive at the selling price.

The meeting was concluded with a report by Mr. Gluntz on activities of the NFFS Management - Cost Group. Mr. von Rosen is handling the advisory work for the group in the Cleveland area. — *Robert H. Herrmann.*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Metropolitan— At the Feb. 3 meeting of the AFS chapter in Newark, N. J., members heard an extremely interesting talk on "Chemical and Physical Properties of Core Binders" by Joseph A. Gitzen, chairman, Delta Oil Products Corp., Milwaukee.

Mr. Gitzen, who was introduced by Frank Hallaigan, foundry superintendent, Ferguson Propeller Co., outlined the factors governing the production of cores, i.e., sand, binders, water, and baking and oven conditions. Mr. Gitzen placed special emphasis on the various properties imparted to the sand by different types of binders. He also pointed out the danger of using materials hygroscopic in nature for cores, since they tend to soak up moisture with resultant increased evolution of gases.—*C. H. Fetzer,* International Nickel Co.

New England— About 165 members and guests attended the Feb. 12 meeting of the AFS chapter at the University Club, Boston. Robert Anderson, Draper Corp., Hopedale, Mass., spoke on "CO_2 Cores for Cast

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Iron," describing use of the carbon dioxide process at the Draper Corp.'s iron foundry. A general discussion of CO_2 practice also was presented by Frank Tibbetts, Wollaston Brass & Aluminum Foundry Inc., North Quincy.— *Fred S. Holway, Mystic Iron Works.*

Texas: East Texas section of the Texas Chapter, AFS, met at the Blackstone Hotel, Tyler, Tex., Dec. 13, to hear W. F. Leonard Jr., safety director, the Southland Corp., Dallas, Tex., discuss "Selling Safety to Your Employees."

Mr. Leonard emphasized the importance of selling safety to supervisors and of their selling safety to the operators. A skit helped to show how to train people in safety promotion activities.

In discussing workmen's compensation insurance costs, Mr. Leonard pointed out that in 1956 they varied among 122 foundries from $1.27 to $3.16 per ton of castings—giving the safety-conscious shops an important cost advantage.

Texas Chapter met at Marshall, Tex., Feb. 21-22. The program included visits to Marshall Car Wheel & Foundry Co. and the Smith Steel Casting Co. of Marshall, with a technical session held at Rosborough Springs ranch. Talks were given by E. F. Jacobs, safety and personnel director, East Texas Steel Castings Co., Longview, and R. A. Colton, Federated Metals Div., American Smelting & Refining Co., Houston. Approximately 150 members were guests of Smith Steel at a barbecue dinner Friday evening.

Lehigh Valley: Feb. 11 meeting of the Lehigh Valley Foundrymen's Association, held at Lafayette College, was attended by approximately 130 members and guests. Sponsored by Lehigh Inc., Easton, Pa., it featured Robert J. Franck, chief product engineer, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., as speaker.

Mr. Franck spoke on "Proper Casting through Experimental Stress Analysis." All phases of planning from preliminary design to actual finished product were explained and extensive laboratory and field testing methods described. A step-by-step analysis of various types of steel castings, weldments was also presented. Utilization of brittle lacquer coat and strain gages for this purpose was explained.

Mr. Franck stated that approximately 25 per cent of their new products are stress analyzed before going into production. Substantial

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Circle 706 on Page 51

weight and cost saving is realized. Smooth contour design aimed at obtaining sound castings through directional solidification is possible.

A film, "The Big Difference," in sound and color, showing the actual development and testing of various castings, supplemented the talk.

Chairman Albert Mathieu, Ingersoll-Rand Co., conducted the business meeting, and H. Winton Streeter, vice president, Lehigh Inc., served as technical chairman.

Following the dinner which preceded the technical meeting, the movie "Fishing for Fun" featuring Bed Hardesty, nationally known professional bait and fly casting champion, was presented.

The next meeting will be held Apr. 8, at Lafayette College.—*R. B. Fisher, Ingersoll-Rand Co.*

Northeastern Ohio—Walter E. Mason, assistant foundry superintendent, Westinghouse Air Brake Co., Wilmerding, Pa., addressed the chapter on "Metal Corebox Equipment" at the Feb. 13 meeting. Approximately 100 were present.

The reasons usually given for using metal pattern equipment are to increase production and reduce cost through use of the equipment on molding machines and coreblowers. At one time such equipment was employed mainly by high production foundries. Now, however, higher labor costs and strict customer specifications make the use of metal equipment almost mandatory.

Proper scheduling and co-ordination of work during construction of pattern equipment is necessary. This requires accurate records on the needs of each job and each phase of each job. Every pattern and corebox comprising a set of equipment should get full attention to detail.

The speaker also discussed blow-in drier equipment. The top half of the box is mounted on the machine blowhead and only the drier is handled in and out of the machine.

Dougherty Lumber Co., Cleveland, sponsored the showing of a movie, "Mahogany—Wood of the Ages," describing the growing, preparation, and uses of mahogany in industry.—*Robert H. Herrmann.*

Twin City—"Aids for Better Gating and Risering" was the subject discussed by Michael Bock II at the Feb. 11 meeting of the AFS chapter at Jax Cafe, Minneapolis. Mr. Bock is vice president, Exomet Inc., Conneaut, Ohio.

Over 100 foundrymen learned about the new exothermic and insulating materials used to increase casting soundness and metal yield.

Successful risering is a matter of controlling heat in risers so that they are the last metal in a mold to freeze. Heat can be lost from the riser metal by radiation, conduction, or convection. Mr. Bock stated that radiation loss is most influential in the high-melting-temperature metals such as steel, while conduction loss affects low-melting-temperature alloys greatest (as aluminum).

For aluminum alloys, insulating sleeves are helpful in reducing header sizes. In iron and steel, exothermic sleeves actually add heat to the headers to correct for high heat loss through radiation. Mildly exothermic sleeves have been used successfully in copper-base alloys.

Two unique feeding practices are practical with the exothermic riser sleeves that are not practical without them: 1. The use of "ram-up" sleeves that can put a blind riser any place on the casting and without reference to the parting plane. 2. Putting risers on a casting away from the gating area.—*J. David Johnson.*

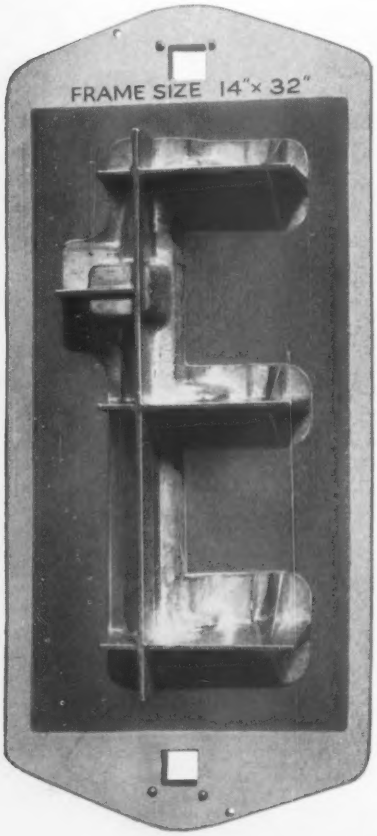
Pittsburgh—Fred L. Riddell, foundry metallurgist, H. Kramer & Co., Chicago, addressed the AFS chapter on Feb. 17. The meeting, attended by 110 members, was held at Webster Hall Hotel.

The main theme of Mr. Riddell's talk was to emphasize to brass and bronze foundrymen the problem of improving casting quality. He suggested establishment of a quality control program.

"Factors which have the greatest influence on quality of copper-base alloy castings are design, raw material (metal, sand, fuel, and refractories), foundry practices (melting and pouring, pouring temperatures, gating and risering), maintenance of equipment, and supervision of workers," the speaker said.

Mr. Riddell discussed each of the factors and showed how each would influence quality.—*Robert M. Love.*

Chicago—The 1958 educational program of the Chicago Chapter, AFS, got under way at the regular monthly meeting at the Chicago Bar Association March 3. "Four Methods of Coremaking" was the course subject and appropriately the



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The Drier pattern at left is for air intake diesel manifold made from an original master pattern. *Only one skrinkage!* Material is aluminum. Pattern was used for 50 Driers. Only 3 hours labor and 35 pounds of TAMASTONE were required. Up to 1,000 castings have been made from a plate of this type!

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kickoff topic was "Why Four Methods of Coremaking?" Speaker was Elmer C. Zirzow, director of foundry service, Werner G. Smith Inc., Cleveland.

The speaker, who is chairman of the AFS Sand Division, explained that the four methods are used to produce better castings more economically. He described impartially and enumerated the advantages and disadvantages of the four methods—oil sand cores, air set cores, shell cores, and CO_2 cores. No one method was recommended over any other.

Chapter President W. O. McFatridge presided at the dinner business session attended by more than 250 members and guests. Roy W. Schroeder, Navy Pier Branch, University of Illinois, introduced 23 new student members of the chapter.

Educational Chairman L. F. Bartosz, steel foundry superintendent, National Malleable & Steel Castings Co., introduced members of his committee, and presided at the technical session. Second and third of the educational course series were conducted at Peoples Gas Auditorium on March 10 and March 17, respectively. Speakers and subjects were as announced in March FOUNDRY, p. 225.

Four group sessions will comprise the program for the chapter's April 7 meeting. Gray Iron and Malleable divisions will combine to hear W. D. McMillan, supervisor of metallurgy, International Harvester Co., discuss "Water Cooled Cupola Operation." Richard Amese, general supervisor, ceramic department, South Works, United States Steel Corp., will address the Steel division on "Refractories and Ladle Practice."

"Aches and Pains of Foundry Maintenance" is the topic which E. W. Greenlees, master mechanic, Kensington Steel Co., will discuss at the Maintenance session. The Nonferrous and Pattern divisions will meet jointly to consider "Eliminating Leakage in Navy 'G' Pressure Castings" with Marvin Glassenberg, associate metallurgist, Armour Research Foundation, as the speaker. —*Erle F. Ross.*

High School Window Exhibit Portrays Foundry Careers

"Career Opportunities in the Foundry Industry" was the theme of an exhibit featured Feb. 24 to Mar. 14 in display windows of Parma High School's Industrial Arts Building, Parma, Ohio. The exhibit was sponsored by Northeastern Ohio Chapter of AFS.

Several photographs portrayed typical foundry jobs from design, research, and engineering through production operations, office work, inspection, and quality control to sales to customers. Numerous examples of work in these operational phases were exhibited in one of the windows. The second window illustrated several molding methods with typical production molds. A group of castings produced in six different metals also were shown.

In addition, illustrative material in this window portrayed the role foundries play in educating their workers and pointed to the importance of the foundry industry in Cuyahoga County where 132 foundries employ 17,400 people whose annual earnings total $80 million.

Market Development Topic of Malleable Founders' Meeting

The Malleable Founders' Society's ninth Market Development Conference will be held April 9-10 at the Edgewater Beach Hotel, Chicago. The main topics of discussion will be "Creative Selling," "Machining," and "How Our Customers See Us."

Wednesday morning George T. Boli, president, Northern Malleable Iron Co. will discuss "Creative Selling—for the Small Foundry," and James H. Smith, general manager, Central Foundry Div., General Motors Corp., will present aspects of "Creative Selling—for the Large Foundry."

In the afternoon, Lyle R. Jenkins, Wagner Malleable Iron Co., will explain "Elevated Temperature Behavior of Malleable" and William C. Truckenmiller, Albion Malleable Iron Co., will go into new data developed by the society's research program on "Malleable Machining Characteristics." G. J. Kramer, Central Foundry Division, will discuss the "Sales Value of Machining Data."

The society's "Redesign and Conversion Contest" awards will be presented at Wednesday evening's dinner.

On Thursday morning, malleable iron customers will tell of their attitudes and opinions of the industry. Included in this group will be Howard Williams, vice president-purchasing, Eaton Mfg. Co., and Lawrence Miles, manager-value analysis, General Electric Co. That afternoon William H. Gove, president, EMC Recording Co., will present an entertaining and informative talk entitled "I'll Swap Ya."

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Circle 708 on Page 51

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...goes right back on the job

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When workers at Austell Box Board Corp. in Georgia pulled this cast iron slurry pump for inspection, they found the inner shell (above left) chewed up by abrasion, with finger-size cracks and gouges.

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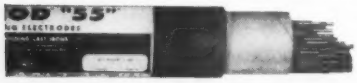

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Circle 709 on Page 51

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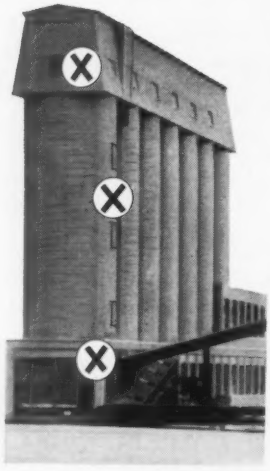
- X What are the characteristics of the material to be stored ... and its "flowability"?
- X What is the volume and rate of discharge?

When planning your next storage bin, may we sit in on the very early stages of planning?



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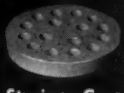
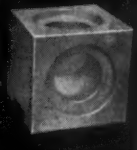
UNIVERSAL refractory gating components

Splash Cores



Strainer Cores



Determine proper gating faster, eliminate slag inclusions, stop rejects, reduce cleaning room time, and lower production costs. UNIVERSAL *refractory* gating components will help you do this, and at less cost than producing your own from sand. Send specifications for price and delivery quotations, or call MA 6-4912

WRITE TODAY FOR CATALOG LISTING SPECIFICATIONS OF STANDARD GATING COMPONENTS

Pouring Tubes

UNIVERSAL CLAY PRODUCTS CO.

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Circle 710 on Page 51

Circle 711 on Page 51

NOW! *A Disc Wheel with a*

"THRO-A-WAY HUB"

7", 8", & 9" WHEELS. These wheels are available in 7", 8", and 9" diameters, and in 1/8, 3/16, 1/4 and 5/8" thicknesses, with the hubs bonded right on!

IT'S REVOLUTIONARY! WHY? Because the wheel adapter is built right into the wheel itself!

IT SAVES because assembly and disassembly is 200% faster.

IT SAVES because purchasing records and stock room records for wheel adapters are eliminated.

IT SAVES because the "THRO-A-WAY HUB" is priced at the depressed center level which doesn't include the adapter assembly.

IT SAVES because it eliminates Disc Wheel adapters for 5/8-11 spindles.

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WESTBORO MASSACHUSETTS

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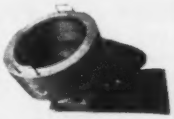
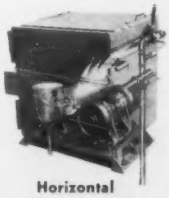
CENTRIFUGAL CASTING MACHINES

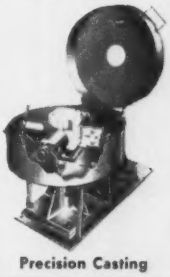
Vertical



Vertical Water-Cooled



Horizontal Water-Cooled



Precision Casting

These machines used to make ferrous and non-ferrous centrifugal castings are produced by the pioneer manufacturer of such equipment.

They are made in a large variety of styles and a wide range of sizes. Complete technical information is supplied concerning sand and permanent mold design, gating, sand mixes, speeds, etc.

Send us drawings or sketches of parts you are interested in casting centrifugally, and we will tell you, without obligation, if and how our machines can cast them faster, cleaner and with fewer rejects.

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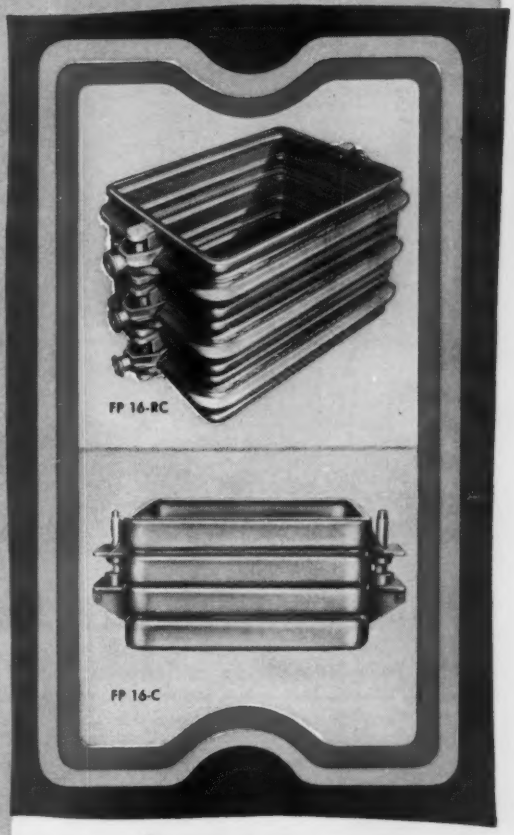
P. O. Box 947 Tulsa 1, Okla.

Circle 713 on Page 51

GREATER STRENGTH-INSIDE



by *American* of course

Added strength and rigidity of these flasks by American lies in the **inside corrugation.** American **INSIDE STRENGTH** of the 1/4" walls actually assures more rigidity than other type reinforcements, more resistance to squeeze of air pressure. Inside corrugation of the walls assist in holding sand—makes for easier shake out, and means that the flasks will maintain their shape and pincenters — give better, longer service.

★ Sturdy, durable streamlined design
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The number of inside corrugations is determined by depth of sections. For extreme pressure, sections may also be furnished with American's special channel welded reinforcement.

AFFCO superior flasks are the result of over 25 years research and best possible workmanship. Write for our new, complete Flask Catalog, and visit our booth #813 at the Foundry Show and Convention in Cleveland in May.

Our facilities assure you of prompt fabrication and quick shipment of your orders.

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Division of Cromb & Gagel, Inc.

AMERICAN FOUNDRY FLASK COMPANY
2745 SOUTHWEST BLVD., KANSAS CITY 8, MO.

Circle 714 on Page 51

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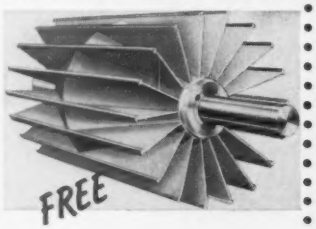
Specify VAN GORP SELF CLEANING PULLEYS

Van Gorp Belt Saver Pulleys offer today's most outstanding pulley features.

Each wing is protected by a half oval bar that provides maximum traction and minimum belt strain. When the pulley starts to rotate the double cone construction discharges all foreign material to sides of the pulley. No more abrasive wear, misalignment or build-up! Cuts maintenance cost and increases belt life.

Modern TAPER-LOCK bushings permit the simplest and surest method of installation.



FREE

Illustrated Catalog Upon Request

IN ADDITION to the 3,000 standard sizes, Van Gorp can custom-build pulleys to your exact specifications.

Excellent territories now available! Write today for complete information, catalog and specifications.

Van Gorp

Van Gorp Mfg. Inc.

Box 123, Pella, Iowa Telephone MAyfair 8-2140

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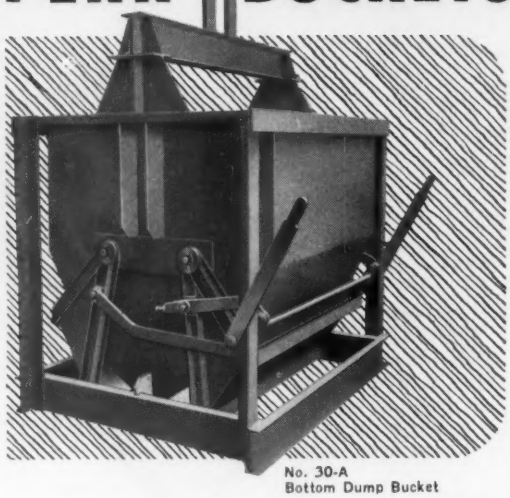
PENN BUCKETS



No. 30-A
Bottom Dump Bucket

Exclusive design makes this bottom dump bucket easy to operate . . . easy to open. Efficient for foundry use in handling all types of sand, moulding or core, dry or prepared. Can be used with coke, scrap iron and castings also. Sizes 7 to 200 cu. ft.

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READING, PENNA.

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CUTS MIXING TIME 50% • MINIMIZES AIR HARDENING
NO HEATING • NO CRUSHING • NO BALLING • EASILY CLEANED
FOR MIXING • CORE SAND • FACINGS • REFRACTORIES
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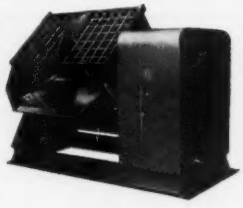
$395
No. 2 Lab. Model
Capacity 100 lbs.

UNITED STATES FORGE AND FOUNDRY CO. PULASKI, N.Y.



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Complete stock LEITZ equipment for immediate demonstration and delivery. Guaranteed Reconditioned Instruments.

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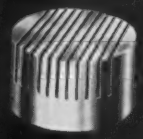
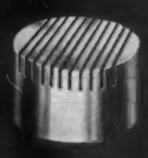
Circle 719 on Page 51

SLOTTED CORE BOX VENTS



X-TRA DEEP HEAD .156 Wide Slots .014

SHALLOW HEAD .031 Wide or Narrow Slots .014 .010



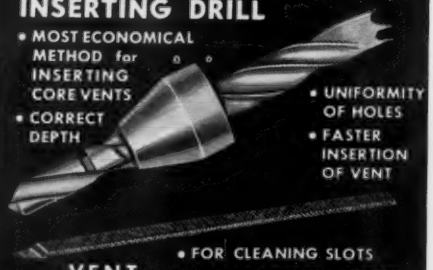
DEEP HEAD .093 Wide or Narrow Slots .014 .010

CO_2 TYPE DEEP HEAD .093 Wide or Narrow .014 Slots .010

Manufactured by **C.M. SMILLIE & CO.** 1124 WOODWARD HGTS FERNDALE 20 MICH

INSERTING DRILL

- MOST ECONOMICAL METHOD for INSERTING CORE VENTS
- CORRECT DEPTH
- UNIFORMITY OF HOLES
- FASTER INSERTION OF VENT



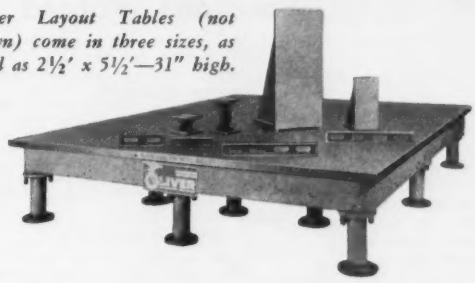
VENT CLEANER

- FOR CLEANING SLOTS
- MADE OF TEMPERED STEEL
- EASY TO USE

Circle 720 on Page 51

OLIVER LAYOUT PLATES AND TABLES... the surest way to insure accuracy and save money

Oliver Layout Tables (not shown) come in three sizes, as small as 2½' x 5½'—31" high.



In pattern shops, or wherever accurate production work is essential, the safest way to insure accuracy, expedite work and save money is to use a Layout Plate or Table. There is no substitute. The Layout Plate shown is 9'x12'—9½" thick. It is stress-relieved to prevent warping. Guaranteed flat within .005". Machined edges simplify clamping. Smaller and larger size plates with various accessories are available. If your work calls for precision, a Layout Plate or Table is the most important investment you can make. Write for full details.

Oliver makes a complete line of Pattern Lathes and Millers and woodworking machines for pattern shops. Investigate.

SINCE 1890

OLIVER MACHINERY COMPANY
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Steel Safety Toe PLUS Air Cushion Insole give Full Safety PLUS Extra Comfort in the BRONSON MOLDER'S SHOE.

An unbeatable combination of Safety, Comfort and Durability is provided in the BRONSON Molder's Shoe. The Molder's Shoe design plus leather lined steel toe box give maximum safety. Air-cushion Insole and built-in longitudinal and metatarsal supports give extra comfort. Double soles, full leather middle sole with Neoprene outsole and heel, and black Elk uppers give maximum wear. Write TODAY for details and prices.

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FOUNDRY

EDWIN S. CARMAN, INC.

LEE ROAD AT MAYFIELD
CLEVELAND 18, OHIO

A COMPLETE FOUNDRY SERVICE

CONSULTANTS

Circle 723 on Page 51

for efficient desulphurization at low cost...

Diamond Foundry Grade ASH

Diamond Alkali's dust-free, coarse particle Soda Ash will give you greater efficiency and economy in your desulphurization operations. Diamond's years of experience as one of America's largest producers of soda ash are at your service. Call your nearby Diamond Sales office, or write Diamond Alkali Company, 300 Union Commerce Bldg., Cleveland 14, Ohio.

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Diamond Chemicals

Circle 724 on Page 51

CLASSIFIED ADVERTISING

Help Wanted

FOUNDRY METALLURGIST

A Foundry Research Metallurgist with a minimum of a B.S. degree and 5 years of experience in foundry operations plus an excellent knowledge of the fundamentals of metal casting is required for a challenging and creative research assignment. Clear analytical thinking and articulate writing ability is an essential requisite for this position.

Located in the Chicago metropolitan area, we offer a generous relocation allowance, excellent employee benefits in addition to an outstanding opportunity for advanced educational training and professional recognition. Salary commensurate with experience.

All replies will be treated as confidential. Please send complete resume to:

A. J. PANERAL
ARMOUR RESEARCH FOUNDATION
Of Illinois Institute of Technology
10 West 35th Street
Chicago 16, Illinois

PATTERN SHOP SUPERINTENDENT

A Wisconsin production gray iron foundry, producing quality automotive and agricultural castings, is seeking a qualified superintendent to take charge of its Pattern Shop and vault. Must be experienced in foundry techniques and capable of supervising 12 to 15 employees in the making and repairing of highly diversified and intricate patterns and core boxes of wood and metal.

A wonderful opportunity for the man who is anxious to succeed. Company offers much: Good salary, excellent security and other fine benefits.

Please list complete background in first letter, including references and salary desired.

BOX 927, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY METALLURGICAL ENGINEER

Excellent opportunity to join management staff of reputable, high quality, nonferrous foundry operation. Require person with several years foundry experience in manufacture of sand, permanent mold and die castings in aluminum and magnesium alloys. Must have aggressive leadership qualities and ability to lead development, quality control and sales programs. Send qualifications to:

BOX 918, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

GENERAL FOREMAN OR ASSISTANT SUPERINTENDENT

Desire man with full experience in molding, gating, cupola and core work. Must be of high caliber and in a position to take over as superintendent in the near future. We operate very modern jobbing foundry, making castings from smallest to 15,000 pounds. We make machine castings which must be of high quality. Excellent opportunity for right man. Address: Box 915, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ASSISTANT FOREMAN FOUNDRY

Excellent long-range opportunity for young man thoroughly trained in modern brass and bronze foundry processes. Experience in core room and cleaning room especially helpful. Will work as assistant to foundry foreman. Plant located near New York City. East coast resident preferred. Please send full resume (with photo if possible) of experience and qualifications and state salary desired. All replies confidential. Address: Box 916, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

ALUMINUM CASTING ENGINEER

Excellent opportunity for man experienced in design, production and metallurgy of aluminum castings. Position involves consulting with other engineers on aluminum casting design and techniques. Automotive background helpful. Location —Detroit. Give age, education, experience, and salary expected.

BOX 941, FOUNDRY
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FOUNDRY METALLURGISTS

Opportunity is knocking for a gray iron foundry metallurgist under 40 who:

1. Would like complete charge of metallurgy, sand control, and foundry engineering with a medium sized gray iron jobbing foundry beautifully situated in New England.
2. Wants to grow with two young men in developing a well established business into an outstanding foundry.

This is a rare opportunity for a well trained man to fit into a situation that is challenging, stimulating and rewarding.

BOX 932, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

PATTERN SHOP SUPERVISOR

A progressive midwest foundry that employs 250 men is seeking a qualified supervisor to take charge of its Pattern Shop and Storage consisting of about 20 men. Along with technical ability the successful applicant will require class organizing and administrative qualifications. Age 35 to 45.

In reply provide complete education and experience background. Replies will be held strictly confidential.

BOX 928, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SUPERINTENDENT

Gray iron jobbing foundry located in Lower Michigan producing light to heavy castings on jobbing floors and machines. Need high type man with administrative and executive abilities who can work into top management position. Knowledge of metallurgy necessary. Under age 55.

BOX 942, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

NONFERROUS FOUNDRY FOREMAN

Medium size aluminum foundry near Cleveland, specializing in medium and large jobbing work. Must know all phases of foundry operations and aluminum alloys. In reply, give age, experience, references, and include a photograph. Address: Box 937, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GENERAL FOUNDRY FOREMAN

For mechanized ferrous foundry in Midwest. Must be experienced in gating. Have knowledge of Standard Costs. Supervise all molding operations. Submit confidential resume. Address: Box 939, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

INDUSTRIAL ENGINEER

Thirty-three year old graduate of General Motors Institute cooperative engineering program with 13 years' experience in metal casting field, including automotive gray iron, university instructing, technical writing, and pit molding job shop, will consider any position related to the foundry industry that offers opportunity as well as challenge. For resume Address: Box 886, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

STEEL—GRAY IRON

Complete system of sand control can reduce production costs considerably in most foundries and improve sales-appeal of products when carried out consistently under competent and experienced direction. Education and twenty years' experience in this specialized field and related foundry problems. Valid reasons for making new affiliation. Available about July 15; interview any time or AFS Castings Show during May. Preferred areas: Milwaukee, Omaha, Denver, San Diego, Portland, Spokane, British Columbia. Address: Box 921, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Good knowledge of all phases of high production foundry operations, experienced in cupola, acid and basic electric steel, automotive and refrigeration pressure castings, shell molding and core blowing. Also refractories, quantitative lab setups, etc. Age 41, married. General superintendent last nine years. Good labor relations. Address: Box 917, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER

Graduate metallurgist, age 36, seeking position as foundry manager (or assistant manager of large foundry). Experienced in alloyed and high quality gray iron engineering castings including several patented flake and spheroidal irons. Capable of cupola and sand control and methods of molding. Good troubleshooter; presently employed; willing to invest. Address: Box 920, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY MANAGER AND METALLURGIST

Presently managing gray iron foundry seeking new affiliation with progressive gray iron or malleable foundry or sales organization. Experience in management, technical, sales and operational phases of gray iron and malleable. Age 36. Address: Box 924, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

TRAINED STEELMOLDER

German, living in Canada, age 22, with six years in various types of steel molding, seeking new connection. Willing to locate anywhere. Address: Box 930, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

TECHNICAL OR SUPERVISORY

Sand technician, seven years with ferrous and nonferrous jobbing and production foundry, desires technical or supervisory position. Thoroughly experienced in sand technology, molding processes and techniques. Address: HARRY A. FINCHUM, SR. 3807 ST. VICTOR ST., BALTIMORE 25, MD.

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumber supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 910, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PRODUCTION ENGINEER

Experienced in cleaning and finishing Steel and Alloy Castings, weighing 1 to 500 pounds. Prefer Ohio, Pennsylvania, or Eastern States. Address: PETER WORTHY, 940 FRANKLIN ST., McKEESPORT, PENNSYLVANIA.

MANAGER—SUPERINTENDENT

Well-known ferrous—nonferrous foundryman and consulting authority on foundry practice desires a good permanent association with a progressive firm. Address: Box 911, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS

Confidential Inquiries Invited
From Employers and Qualified Applicants
For Fast Competent Assistance Contact

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JOHN COPE, DIRECTOR **220 SOUTH STATE ST., CHICAGO, ILL.**

Positions Wanted

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SUPERINTENDENT OR MANAGER
Progressive foundryman familiar with every phase of practical experience on all classes of work. Now employed. Would like to make change. Address: Box 934, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGICAL ENGINEER
Manager in his fifties would like full or part time position setting up research and development department for progressive small or medium-size foundry. Address: Box 926, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER
Have extensive background in all phases of manufacturing, plant layout, methods and foundry practice, offering maturity of judgement and proven ability for cost saving. Excellent references. Address: Box 925, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER
Thorough knowledge of all practical phases of steel and iron foundry operations, jobbing and production. Engineering graduate, cost and quality minded, excellent personnel relations. Address: Box 933, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ASSISTANT SUPERINTENDENT OR FOUNDRY METALLURGIST
Experienced in melting, molding, sand control, annealing, coremaking, pattern layout, gating and risering of gray iron, malleable, pearlitic malleable and steel. Two years' technical foundry training after B.S. degree. Address: Box 943, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PERMANENT MOLD FOUNDRYMAN
Graduate metallurgist experienced in design, estimating, operation. Over 20 years in nonferrous castings, including sand, shell and die casting. Address: Box 900, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER
Progressive foundryman with 30 years' experience in all phases of quality production of gray iron castings, squeezer, floor and mechanized. Address: Box 904, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN
German, living in Canada, age 47; thorough knowledge of all phases of gray iron foundry operations, including cupola; 32 years gray iron foundry experience, 13 years foundry supervision. References furnished. Address: Box 938, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON METALLURGIST
Nineteen years experience jobbing, heavy machinery, automotive and powdered iron melting; covering metal, sand and casting quality control. Illinois Tech student, age 46. Salary open. Will relocate. Address: Box 929, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER
Young foundryman thoroughly versed in all gray iron operations. Degree in Metallurgical Engineering. Interested in responsible position with opportunity. Address: Box 944, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT
Practical and technical, 30 years' experience jobbing and production. Familiar with every phase of the foundry. Now employed. Address: Box 940, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

INVESTMENT CASTING
Graduate Engineer, age 31. Eight years' diversified experience all phases process, including sales. Energetic administrator. Seeking management position requiring creative ability, drive and initiative. Possibly consider consultation project, plant layout, processing, sales, etc. Address: Box 945, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Electric furnace acid and basic practice, carbon and alloy steels, capable of taking complete charge. Address: Box 905, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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PLEASE NOTE!

Our next issue is the special Pre-Convention issue — MAY. Copy for this issue must reach us no later than April 11th. Thank you for hurrying copy to us and remembering: it pays to advertise in FOUNDRY's Classified!

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Thirty-five years' Experience
Acid and Basic Practice
Improved methods in electric furnace melting. Low cost with high productivity. Avoid expensive mistakes. Acquire consultation prior to the purchasing of your new furnace and in planning, modernizing, and organizing of your melt shop.
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Available for Melt Shop Problems in technical and customer service. Broad industrial experience in all processes for carbon, low and high alloy iron, and steel making. Address: Box 913, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY CONSULTANT
Aluminum or gray iron. Have you cupola, sand, core, or any of the many other foundry troubles? Let 45 years of practical experience come to your aid. Address: Box 936, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY CONSULTANT—NONFERROUS
Sand — permanent mold — centrifugal permanent mold — and centrifuge permanent mold. High pressure castings a specialty. Address: ED JENKINS, RT. #3, BOX 345, WALKERTON, INDIANA, PHONE: 712W.

FOUNDRY CONSULTANT
Ferrous and nonferrous. Correct methods and practices necessary to profitable foundry operation. Address: CHARLIE AMMEN, 1029 PHILIP ST., NEW ORLEANS, LA.

Representatives Wanted

REPRESENTATIVES WANTED
Manufacturers require agent in all parts of the U. S. Principals at Cleveland in May.

BOX 947, FOUNDRY
PENTON BLDG. **CLEVELAND 13, OHIO**

SALES REPRESENTATIVES
National foundry equipment and supply company offers profitable association for experienced salesmen. Liberal commission on exclusive territory basis. Prefer men with knowledge of melting furnaces. Certain other lines in foundry equipment and supplies also open. Submit resume immediately to: Box 931, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

DISTRIBUTORS WANTED
With or without facilities to carry inventory for major European conveyor belt line, attractively priced, high quality and quick delivery assured. Please indicate territory covered and present lines. Address: Box 914, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Opportunities

PERMANENT MOLD METHOD AVAILABLE

THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

Wanted-To-Buy

WANTED TO BUY
1—Whiting #3 Cupola complete with blower, or any other make lined to 28" that can melt 2½ tons per hour.
1—½ Ton side blow steel converter.

BOX 923, FOUNDRY
PENTON BLDG. **CLEVELAND 13, OHIO**

INVESTMENT CASTING EQUIPMENT
Small motor-generator induction furnace; injectors; casting machines; mixers; ovens, etc. Equipment must be in good operating condition. State all particulars. Private buyer. Address: Box 946, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

DESIGN AND CONSTRUCTION DETAILS
Will pay flat fee to competent designer for complete construction drawings for multiple crucible gas fired steel melting furnace. Address: Box 935, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MIXER WANTED
Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED
Perkins Sigma Black Mixer, 100 gallon working capacity. Must be in good condition. Address: Box 887, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Foundry Wanted

FOUNDRY WANTED

Interested in purchasing small aluminum and brass foundry in New York Metropolitan area. Replies confidential. Address: Box 919, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundries For Sale

FOR SALE

Well established Brass and Aluminum foundry, located within 100 miles of Chicago. Brass melting capacity 6000# per day, aluminum capacity 4000# per day. Completely equipped with International joint squeezers, rollovers, and pin lift machines. Owner's health reason for disposal. Address: Box 893, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON JOBBING FOUNDRY

Established in 1886. Producing gray iron and alloy castings for automotive and machine tool industries. Fully equipped, ready for operation. Capacity 20-ton a day. Main building 200 x 156 feet with two 10-ton Northern cranes, two core ovens, one No. 6 Whiting cupola, three GMC trucks. Located on New York Central Railroad siding with ample storage and parking space. Will sell to close estate. PHONE: WOODWARD 5-3492, DETROIT, MICHIGAN.

For Sale

FOR SALE

2—(Serial #-B-251) "Light Type" U. S. Rotary Smelting furnaces, 1100# dry charge (1-left hand, 1-right hand) with rotating motors, oil burners, clamp caps and lugs for spout; 2 HP G.E. reversible rotating motors, 3 phase, 60 cycle, 220 volt switches; Size 717 "AF" Victor Acme blowers on extended bedplates V-belt drives to 10 HP G.E. motors, 1800 rpm, 3 phase, 60 cycle, 220 volt magnetic switches, push button stations, blower relief valves.
1—4′ x 10′ totally enclosed double deck Selectro Vibrating Screen. Serial VB 2813, V-belt drive; 5 HP, 1750 rpm, 220/440 volt, 3 phase, 60 cycle enclosed fan cooled motor; 4 to 80 screens included. Address: PROMAT, BOX 99, WAUKEGAN, ILLINOIS.

For Sale

FOR SALE — ALMOST NEW — LATEST TYPE
DIVINE, Rotary, Automatic Polishing and Buffing Machine, 8 spindles, 6—3 HP heads, 72" diameter table, with applicators.
PACKER, Rotary, Automatic Polishing and Buffing Machine, 9 spindles, 5—10 HP heads. 60" diameter table, with applicators.
HAMMOND, Rotary, Automatic Polishing and Buffing Machine, 10 spindles, 4—5 HP heads. 46" diameter table.

BOX 103
RICHARD-LEWIS CORP.
1182 BROADWAY
NEW YORK 1, NEW YORK
EV 7-7178

CLASSIFIED ADVERTISERS

PLEASE NOTE!

Our next issue is the special Pre-Convention issue — MAY. Copy for this issue must reach us no later than April 11th. Thank you for hurrying copy to us and remembering: it pays to advertise in FOUNDRY's Classified!

FOR SALE

#1½ SIMPSON MIXER—WITH LOADER, UD Model—Ser. 82907 ..... $3500.00
TABOR JOLT ROLLOVER MOLDING MACHINE, 30" x 40"; 12" draw; shockless; 1000# cap. 650.00
WORTHINGTON AIR COMPRESSOR, 6 x 7, 15 HP; Ser. #L 51311 ..... 950.00
GARDNER HORIZ. DISC GRINDER, 54"; 20 HP 650.00
DETROIT ROCKER BARREL ELECTRIC FURNACE, 350# cap. Ser. #289 .. 1950.00
Also other foundry equipment

FOR THE BEST DEAL CALL
BALCHER MACHINERY COMPANY
695 E. 152nd Street
Cleveland 10, Ohio
Telephone: GLenville 1-2474

FOR SALE

MOTORS—GENERATORS
TRANSFORMERS
Unused—Rebuilt
WORLD'S LARGEST INVENTORY

ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P.O. Box 51—Rochester 1, New York

For Sale

FOR SALE

CLEARFIELD Muller 230C
OSBORN 212J, Jolt Squeezer
DAVENPORT Rollover 3428 AJS
CHAMPION Pin Lifts, Jolt Squeeze JSL 12 P
TABOR Pin Lifts, Jolt Squeeze
DAVENPORT Rollover 28 SA
J & J 610B Rollover
INTERNATIONAL Rollover 30 x 8, Portable
INTERNATIONAL Rollover 24 x 10, Portable
INTERNATIONAL Rollover 30 x 8, No Jolt, Portable
SPO 506, Jolt Rollover, Pattern Draw, Pin Lift
OSBORN 275J Jolt Squeezers
INTERNATIONAL LJS 12 Jolt Squeezers
INTERNATIONAL PJS 9 Jolt Squeezers
MILWAUKEE 104 Jolt Squeezers
CHAMPION JS 108 Jolt Squeezers
ARCADE 100S Jolt Squeezers
NICHOLS Plain Molder, High Speed
SPO 110 Jolt Squeezer
TABOR Jolt Rollover Draw
INTERNATIONAL Plain Jolt, 36 x 45 Table
INTERNATIONAL Type R Core Rollover, Hand op.
ROYER SAND PREPARATORS
SIMPLICITY PREPARATORS
BEARDSLEY & PIPER PREPARATORS
BLYSTONE Sand Mixers, Paddle Type
PORBECK Core Oven, Drawer Type
COLEMAN CORE OVENS, Drawer Type
PORBECK Core Ovens, Vertical Door Type
FOUNDRY EQUIP. Co. Door Type Core Oven
GRINDERS, Double End from ½ hp. to 25 hp.
DISC GRINDERS
LADLES from 50 lbs. to 500 lb. Geared and Bail
POURING DEVICES from 500 lb. to 200 lb.
GYRATORY RIDDLES
MONORAIL & BRIDGES
AIR HOISTS 500 lb. to 4000 lb.
OVERHEAD CHAIN CONVEYOR #485 — TRACK—DRIVES
BLOWERS—Centrifugal—Positive—Exhaust
DUST COLLECTORS

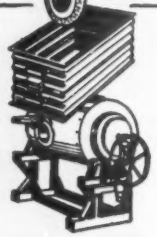
FLASKS
ALUMINUM
SLIP & POP
Sizes from 10" x 10" to 48" x 48"
JACKETS—Aluminum & Iron
STEEL FLASKS
Sizes from 10" x 10" to 9' x 9'
Transite Core Plates

MANY OTHER ITEMS IN STOCK
SEND US YOUR INQUIRIES
WE BUY—SELL—TRADE

THE HOMAN MACHINERY CO.
710 E. FRONT ST.
CINCINNATI, OHIO
MAIN 10339

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD — **CLEVELAND 10, OHIO**



OSBORN ROLLOVERS:
4—405, 18" draw, air clamps, 3500# cap.

WHEELABRATORS
1—20" x 27" 2 cu. ft. Tumblast
1—27" x 36", 5 cu. ft. Tumblast, w/loader
1—36" x 42", 11½ cu. ft. Tumblast, w/loader
1—42" x 48", 17½ cu. ft. Tumblast, w/loader
1—36" x 42" air blast Wheelabrator
1—4′ Swing Out Table

PANGBORN
1—18 cu. ft. Rotoblast Master, w/loader

SAND SLINGERS
1—B-P Riddle type, 19" head, 4" tip
1—B-P Motive Jr., 19" head, 4" tip

SWING GRINDERS
10—10 H.P. Mummert-Dixon Model 1814
3—25 H.P. Safety Grinding Wheel Model 204

ELECTRIC FURNACES:
1—80 lbs. Detroit Rocking
1—350 lbs. Detroit Rocking

ASK FOR OUR COMPLETE LISTING — GLENVILLE 1-1222

For Sale

POWER EQUIPMENT CO.
OFFERS
BARGAIN PRICES
ON GUARANTEED
NEVER USED AND REBUILT
MOTORS!

APRIL SPECIALS
REBUILT MOTORS

HP	Make	Type	Speed
400	West. S.B.—Open	CS	900
250	G.E. T.E.F.C.B.B.	K-6335	1800
150	G.E. T.E.F.C.B.B.-XP	K-6328	3600

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Cash for your surplus new & used electric equipment.
Send your list today.

Large line of motors, control equipment, AC & DC Generators, MG sets and transformers.

POWER EQUIPMENT CO.
8 Cairn St., Rochester 2, N. Y.
Phone GEnesee 8-5629

FOR SALE

1—Simpson #0 Muller—Style M (never used).
1—Lancaster Stainless Steel Counter-Current Batch Mixer, Type LW-62.
1—Lancaster Mixer, Model EBG-4.
1—Lancaster Mixer, Model EAG-3.
1—Ingersoll Rand Air Compressor, Type PRE-2, 24" x 16", 100# pressure with 300 HP motor.
3—Link Belt Roto-Louver Rotary Dryers, Models: 207-10; 310-16 and 502-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R.R.
UNION, NEW JERSEY

FOR SALE

2—Ingersoll-Rand Air Compressors, good condition:

1—PRE2, 24 x 12½ x 14 stroke, 210 HP, 440 volt synchronous motor, complete with exciter. Serial No. 40569-40570.

1—Type 10, 17 x 10½ x 14 stroke, 150 HP, 440 volt belt driven motor, complete with reduce voltage compensator, Serial No. 36266-36265.

ALBION MALLEABLE IRON COMPANY
ALBION, MICHIGAN

FOR SALE

Two Demmler #1 core blowers—one practically new, one just completely overhauled—serial #3958, 3966.

RED JACKET MANUFACTURING CO.
DAVENPORT, IOWA

FOR SALE

1000# tilting type aluminum Stroman melting furnace, gas fired, 2-burner, completely reconditioned, ready to use with two new crucibles. Address: FAIRFIELD ALUMINUM CASTINGS COMPANY, 603 N. 8TH ST., FAIRFIELD, IOWA.

FOR SALE

2—Lindberg Radiant Fired Electric Furnaces complete with controls, 440 V, 50 KW. Address: ALUMINUM MATCH PLATE CORP., 1500 MILITARY RD., BUFFALO 17, NEW YORK.

For Sale

SAND BLAST EQUIPMENT
SELL-BUY-TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

$10,000 stock of new Pangborn replacement parts for 6 & 9 LG-14 Table Blast priced 25% less list. Send us list of parts wanted.

9' LG-14 Pangborn Table	$4500.00
6' LE Pangborn Air Table	800.00
Pangborn 53 EN2 Hand cabinet	325.00
Pangborn Auto Peening cabinet	1100.00
48 x 48 Wheelabrator Tumblast	5000.00
42 x 48 Wheelabrator Tumblast	1500.00
27 x 36 Wheelabrator Tumblast	2750.00
15" Continuous Wheelabrator Tumblast	1000.00
8' Wheelabrator Table Blast	2000.00
7GK2 Pangborn Rocker Barrel	2000.00
14 LG5 Pangborn Rotoblast Multi-Table w/5—5' tables	9000.00
Pressure Tanks, all types	150.00 up
Vapor Blast cabinets	400.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. Jefferson
Detroit 9, Michigan
VI-36750

We will Buy one piece or your entire plant; or represent you at any auction at a savings to you.

FOR SALE

AMERICAN WHEELABRATORS

1—15" x 20" Rubber Belt W/Dust Collector
1—20" x 27" Rubber Belt W/Dust Collector
2—27" x 36" Steel Flights W/Loader (like new)
2—36" x 42" Steel Flights W/Loader
1—42" x 48" Steel Flights W/Loader (like new)
1—48" x 72" Steel Flights W/Loader
1—48" Swing Table
2—1-A Multi-Tables 9-19" Tables or 6-26" Tables (like new)

PANGBORN

1—Pangborn Rotoblast 18 Cu. Ft. W/Loader

DUST COLLECTOR

1—American Air Filter, Size 24, 20,000 CFM, Wet Sludge Ejector, Type W Arr. C, Excellent Condition

FOUNDRY ASSOCIATES
4601 WEST ROSCOE
CHICAGO, ILLINOIS
Spring 7-6654

FOR SALE

New 1957

1—Whiting Model C 3½ Front Slagging Cupola
10—Drop Bottom Charging Buckets for above
1—Ingersoll-Rand 30 HP 24 oz. 3000 CFM Blower for above
1—Shepard Niles Charging Crane for above
1—2000# U Shaped Covered Mixing Ladle

New 1953

1—Spencer 1550 TC 50 HP 24 oz. 4800 CFM Cupola Blower

J. S. WHITE COMPANY
P. O. BOX 575
PAWTUCKET, RHODE ISLAND

FOR SALE

1—Self-contained 30" wide May-Fran Steel Conveyor, 40 feet long with 3HP Drive $1400.00

DOSTAL FOUNDRY AND MACHINE CO.
2500 WILLIAMS DRIVE
PONTIAC, MICHIGAN

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

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the many types of headings under which classified ads are listed? There's one for every want—if you want to obtain qualified personnel, want to sell used machinery, want to buy equipment, or want a better position, you should advertise in the classified section of FOUNDRY.

FOUNDRY has 75,000 readers. They represent a readership which covers the entire foundry industry. What does this mean to a classified advertiser? It means that for a nominal sum you get the widest possible coverage of the industry. Your message reaches "just the right people".

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Foundry ★
Cleveland 13, O.

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AIR COMPRESSORS
COMPLETE STOCK—BURY, PENNSYLVANIA, SULLIVAN, INGERSOLL-RAND —SEND YOUR REQUIREMENTS

BLOWERS
25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM-GREEN, FISHER Positive Pressure & Cent. Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS
1—AMERICAN 48" Swing Table
1—AMERICAN 15" x 20" WHEELABRATOR TUMBLAST, w/dust collector
1—AMERICAN 27" x 36" WHEELABRATOR TUMBLAST
1—AMERICAN 36" x 42" WHEELABRATOR TUMBLAST
1—AMERICAN 42" x 48" WHEELABRATOR TUMBLAST, w/loader
1—15" Continuous AMERICAN TUMBLAST, 4 tons per hour capacity
1—AMERICAN 36", Continuous WHEELABRATOR, side discharge, two head, Serial #A95643, New 1953. Used 2 months
1—PANGBORN 6' TABLE-ROOM, Type LK
1—PANGBORN TABLAST, 8' Table
1—WHITING 36" x 72" Round w/gear head motors & brakes
1—SLY, Twin Unit, 40" x 24" Round, 10 HP
1—SLY, 68" x 32" Round
10—WHITING 36" x 36" x 72" w/gear head motors & brakes

CONVEYORS
1—HEWITT ROBINS Vibrating, 18" x 10'
1—JEFFREY, 3 compartment, ingot mold
1—LINK BELT, vibrating, double deck, 80' x 24", w/exhaust hood
1—LINK BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
2—LINK BELT, 30" Steel Apron Conveyors. 100' Centers
4—SAND ELEVATORS, Various sizes
6—SAND BELTS, 10' ctrs. to 140' ctrs.
2500 FEET—FOUNDRY TYPE ROLLER CONVEYOR—ALL SIZES

CORE BLOWERS
1—CHAMPION CB-12
10—DEMMLER #1, #2, #2A, #2K, #3K, #4E
3—INTERNATIONAL SB-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A", Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.

CUPOLAS
1—MORRIS #9, Skip charger, Blower, Mixing Ladle, Never Installed
1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING Skip Charger for #5 Cupola

DUST COLLECTORS
1—AMERICAN WHEELABRATOR, Model #115KD, 20' L x 9' W x 9' H
10—ROTOCLONE #12, Type N, #14D, #16W, #20D, #24W, #30W

FURNACES—DIRECT ARC MELTING
1—250 Lb. LECTROMELT, Side Charge
1—3000 #/hr LECTROMELT
1—3000# HEROULT
1—6 Ton HEROULT

FURNACES—INDIRECT ARC
1—350# DETROIT LFA
1—500# DETROIT, LFN, Hydraulic
1—750# DETROIT LFY, Conical Shell
1—1500# DETROIT AA, 300 KVA
1—3000# DETROIT C, 500 KVA

FURNACES—INDUCTION MELTING
1—3 KW, AJAX, Lab type
1—20 KW, AJAX SPARK GAP, High Frequency
1—50 KW AJAX 100# Cap. MG set
2—150 KW AJAX, Brass Melting
1—333 KW AJAX 1000#

HURRY . . . MUST SELL NOW

3 Ton Top Charge SWINDELL ARC FURNACE

Unit is in Excellent Condition, Dismantled, ready for Immediate Delivery.

IMMEDIATE DELIVERY

FURNACES—GAS & OIL
1—FISHER MNP, Gas Tilting, 1700# cap. Mag.
2—FISHER, Gas, Stationary, 4 Burner, 500# cap.
3—HAUSFELD, Stationary, Gas, 250# to 1000# capacity
1—HAUSFELD, Tilting, 1200# capacity
1—STROMAN, Gas Tilting, 1000# cap. Alum., auto control hyd. lift

FURNACES—HEAT TREAT
1—2' x 3' x 6' deep, gas fired, 1800° F.
1—20" x 24" deep, L&N Homocarb electric
1—20" x 36" L&N Draw electric
1—5' x 8' LEE WILSON Pit Type electric

GRINDERS
1—5 HP CINCINNATI, 2/60/110
1—5 HP GARDNER, 12" x 2½" wheels
1—7½ HP U. S. 2300-8400 RPM, 14" x 2" wheels
1—7½ HP U. S. 3/60/220, 20" wheels
1—7½ HP U. S. Model 66, 14" x 3" wheels
1—10 HP U. S. Model 65, 20" x 3" wheels
3—10 or 15 HP SWING FRAME, 22" wheels

MOLDING MACHINES
Jolt Rollover Pattern Draw
1—J & J #1020, 50" x 60" Table, 3000#
2—J & J #918, 44 x 54 Table, 20" draw
1—J & J #815, 30" x 40", 15" draw, 1200# jolt
2—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 50" x 72"
1—HERMAN 3000#, 30" x 66" Table
2—HERMAN 1500#
1—HERMAN 750#, 30" x 36"
2—INTERNATIONAL, 13" x 17" table, 6" draw
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask size 64" x 50", 18" draw
1—OSBORN #42, 15" x 20", hand draw
4—TABOR 40" x 60", 1500 & 3000# capacity
2—TABOR, 30" x 40" w/air clamps, 1000#
1—TABOR 22" x 42", pattern draw, shockless, portable
1—TABOR, 20" x 30" w/air clamps, 1000#
2—TABOR, 14" x 16" Rockover
Plain Jolt
5—DAVENPORT, table sizes 24" x 27", 30" x 30", 1200# to 1800#
1—OSBORN #102
1—SPO #58P, 18" x 28" table, 800#
Jolt Pin Lift
1—HERMAN #4317, 22" x 30" table
1—J & J #681-C, 30" x 25" table, 600#
1—MILWAUKEE #1536, 32" x 38", 1500#
1—OSBORN #559, 25" x 30" table, 6" draw, 1200#
3—SPO #305, #307, 750 lb., 1500 lb.
1—TABOR, 17" x 20" table, portable
1—TABOR, 20" x 20" table, hand strip
1—TABOR, 20" x 24" table, 600#
Jolt Squeeze Pin Lift
2—INTERNATIONAL, PKL, 18" x 24" table, 12" sq.
1—MILWAUKEE #126, 21" x 27" table, 12" sq., 1200#
2—MILWAUKEE #163, 15" x 24" table, 11" sq.
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq.
1—OSBORN #716PJ, 22" x 34" table, 1250#
5—SPO #2114P, 21" x 27" table, 600#
2—SPO #2136G, 21" x 30" table, 800#
Jolt Squeezers
4—INTERNATIONAL #10 LJS, 17" x 20"
1—MILWAUKEE #104-5JS, 17" x 21", port.
1—NICHOLS #12 F-P, portable, 600#
31—OSBORN #275J, #275PJ, 17" x 20" tables, 10" sq., 400#
2—SPO #110J, 17" x 20" table, port.
8—TABOR, 3" jolt, 17" x 20"

MATERIAL HANDLING
1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—CLARK, Fork Lift, Gas, 3,000 lb., capacity, Solid Tire

MULLERS AND MIXERS
1—B&P #70 Speedmullor, 6'5" Dia., 15 cu. ft. batch
1—B&P #40 Speedmullor, 5 cu. ft. batch
1—B & P, Conventional, SIMPSON type, 87½" Dia., arranged for cooling
2—LANCASTER Mixers, #4, 5' Dia. Pan. 3-9 cu. ft. cap.
1—MULLER Plaster & Mortar Mixer, 3 cu. ft. batch, Pneumatic Tires
5—SIMPSON #0, U, D, 3' Dia., never used
1—SIMPSON #1, 4' Dia., Style U.D. 4 cu. ft. batch, with loader
1—SIMPSON #1, 4' Dia., Open Gear, 4 cu. ft. batch
1—SIMPSON #1½ Style U.D., 4'6" Dia., 6 cu. ft. batch, with loader
1—SIMPSON #2, 6' Dia., 14 cu. ft. batch
1—SIMPSON #3, 8' Dia. Unit Drive, with loader 20-25 cu. ft. batch

LADLES AND POURING DEVICES
Bottom Pour
2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 50" top
Lip Pour
1—WHITING 42" x 42" top dia., geared
Cylindrical
8—WHITING, 26" L x 25" dia., 1100# iron
7—WHITING 19" L x 25" dia., 600# iron
3—WHITING, 38" L x 28" dia., 2200# iron
Pouring Devices
7—WHITING, 850# to 2000# gross cap.

OVENS
1—COLEMAN, OIL, one compartment, recirc., 60" W x 80" H x 14'6" L
1—COLEMAN, Gas, 2 Comp. and 5 drawers, OD. 22" x 12' x 10'
3—GENRICH, Elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 6'7" L
2—ROSS, Gas, 2 compartment, recirc., rack type, 6½' x 14' x 7'

SAND CONDITIONING
2—B & P Screenarator, Model "M"
1—JEFFREY Sanditioner, Portable, 10-15 tons/hour, 2 H.P. Motor
1—NATIONAL ENGINEERING SAND-PREPARATOR Unit w/permanent magnet pulley
1—ROYER PREPARATOR, Comb. Model NDC, 25 Ton/hr. Scrap removal, 8' x 8' hopper
2—ROYER, NDP 15-25 tons/hr., 2 HP Motor
2—ROYER, NC-2, 10-15 tons/hr., 1½ HP Motor

SAND CUTTERS
1—AMERICAN, 15 HP, 96/78 Reel
1—AMERICAN, 10 HP, 48" Reel

SAND SLINGERS
2—B&P Tractor Type, 19" head, 4" tip, w/mag. separator, New 1947

SHAKEOUTS AND SCREENS
1—HEWITT ROBINS, Vibrex screen, 3' x 8'
3—SIMPLICITY, 3 x 8, 5 x 8, 8 x 10

MISCELLANEOUS
1—HOWE WEIGHTOGRAPH SCALE, Model 1700
1—KANE & ROACH WIRE STRAIGHTENER, Model DX-5
1—PATTERSON-KELLEY Twin Shell Dry Blender, 3 cu. ft. capacity
FLASKS, CORE PLATES, All Sizes

UNIVERSAL MACHINERY AND EQUIPMENT CO.

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over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

AIR & ELECTRIC HOISTS

15—DETROIT Air Hoists, 1, 1½, 5 ton cap.
2—P&H and DETROIT Model LHR, 5 ton.
20—THOR air hoists, ½, 1 & 2 ton cap.
85—INGERSOLL RAND Air Motor Type. Sizes RC-5, A, B, C, D-6, ¼, ½, 1 and 3 ton capacity.
4—KELLER 1 ton capacity air hoists.
1—SHAW BOX 2 ton load lifter.
2—YALE ½ ton.

BUCKET ELEVATORS

12—LINK BELT & JEFFREY, 30, 40, 50, 60 ft. cc, 10 x 7, 12 x 7, 14 x 7 buckets.

CUT-OFF MACHINES

2—AMERICAN H-Rod Straighteners.
1—DeWALT ME 2, 10 HP, 24" Blade.
1—GROB Band Saw, Type OS-36.
TABOR C10AF—18" wheel, 10 HP.
3—TESSEMER H & I Spur Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER Model Nos. 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4, & 4E. From 10 to 100 lb. Cores.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. cores.
3—MILWAUKEE #3A Bench Type.
1—SPO Model SC-10-DM Shell Core Blower.
1—SAN-BLOW, Model CB-40-B, 40# Cores.

CORE OVENS

4—CARL MAYER 2-Compartment, oil fired, I.D. 7' W x 14' deep x 8' H each.
1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
1—THERMONIC Model M800A Dielectric. Cap. 900#s per hour.
1—YOUNG BROS. 6' x 6' x 9' double door, rack type, gas fired.

CUPOLA BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP, 3500 to 10,500 CFM w/blast gates.
1—ROOTS 7,000 CFM, 50 HP motor.
1—ROOTS CONNERSVILLE Type RCS Size 20 x 60 w/75 HP motor.
1—MODERN No. 3½ Cupola.
1—CUPOLA Bondactor, style 1205-L.
1—WHITING No. 6 Cupola.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W, Sizes No. 10, 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

1—AJAX 20 KW Induction Unit.
1—TOCCO 20 KW Induction Unit, 9600 cycles.
3—AJAX No. 100 & 300 Furnaces Only.
1—BOOTH one ton, direct arc, side charge with 1500 KVA Transformer with gear and all controls.
1—DETROIT Size CM—8000# Cold Charge w/1000 KVA transformer.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilting. Sizes 150, 400, 600, 1000, 1700, 2000 & 2400#, aluminum capacities. Gas or Oil Fired.
5—LINDBERG FISHER Type BBI Hand Tilting Furnaces, Sizes 100, 125, 225.
29—LINDBERG FISHER & CAMPBELL, HAUSFELD Stationary, Sizes 100, 150, 200, & 550 capacity. Gas or Oil Fired.
1—STROMAN Model JC Cradle Type Hydraulic tilt, 2000# capacity. Iron.

HEAT TREAT FURNACES

1—DESPATCH Model DT-26, 38" diameter x 26" height, gas fired recirculating, 1250°, pit type.
1—SURFACE COMBUSTION, 54" x 96", box-type, gas fired, 1850° F.

GRINDERS

Swing Frame

1—MARSCHKE 20" x 10" wheel, 10 HP.
2—FOX No. 6, 24" x 10", 15 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging

2—U. S. #64, 20" x 3", 7½ HP, 4 speed.
2—SAFETY #174, 24" x 3" wheel 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 30 HP, 4 speed.

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder, 16" dia. Wheel.

Horizontal Disc

GARDNER No. 124—53" wheel, 20 HP

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 1500, 2450, & 3000 lbs. capacity. All Enclosed Gears.
12—MODERN Model F-9 and FA-9 Pouring Devices, with ladles 400 to 800 lbs.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000, & 80,000 lbs. capacity.
7—MODERN & WHITING Cylindrical Mixing Ladles, 2 & 3 ton capacities. Electric & Manual Tilting.
7—WHITING Bottom Pour 4 ton.

MUST BE SOLD

INDIVIDUAL ITEMS OR BULK
WHITING No. 9 Cupola
With Swivel type Charger Skip
Hoist type w/storage hoppers
Scales & Cone Bottom "Wish Bone" Buckets, Mixing Ladle & Blower.

MOLDING MACHINES

Jolt Squeezers

37—OSBORN, SPO, MILWAUKEE, Portable & Stationary, 10" Squeeze Cyl.
13—OSBORN, MILWAUKEE & SPO Portable & Stationary, 12" Cylinder.

Plain Jolt

1—HERMAN 40" x 58" table, 3000# cap.
1—HERMAN 8' x 12' table, 32,000# cap.
1—J&J 50 x 72 Table—5000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28-SA, 29" x 40" table.
2—DAVENPORT 40-SA, 42" x 50" table.
3—HERMAN 1500 lb. Series, 26" x 48".
1—HERMAN 750 lb. Series, 20" x 30.
2—HERMAN 4000 lb. Series, 40" x 60".
14—INTERNATIONAL Type G, Sizes 20" x 8", 24" x 10".
1—INTERNATIONAL RES Size 15" x 8".
2—J & J #612, 24" x 30" Table.
4—J & J #918, 44" x 54" Table.
1—J & J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
1—MILWAUKEE #60B-3, 60" Flask.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35 x 50—2000# cap.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 9336, table size 22" x 28".
1—SPO Model 508, table size 28" x 30".
1—SPO 506—24" x 30" Table 10" Draw.
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 32" Table, 10" Draw.

Jolt Pin Lift

3—INTERNATIONAL JDP 1600 X 10" draw, 36" x 36" table.
2—OSBORN #559, 25" x 30" Table.
2—MILWAUKEE #2542, 38" x 42" Table.
1—SPO #3058, 22" x 28" Table.
1—SPO #3102—42" x 50" Table.

Pin Lift

9—INTERNATIONAL & B & P Speed Draw. Used with Sand Slinger. Cap. 600 to 2000 lbs., up to 30" x 40" flasks.

Jolt Squeeze Pin Lift

1—MILWAUKEE #125, 21" x 27" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
4—INTERNATIONAL PKL, 17" x 26".
1—INTERNATIONAL PK-20, Size 20" x 8".
1—OSBORN 716 PV—22" x 34" Table—16" dia sq cyl.

CONVEYORS

Steel Apron

9—JEFFREY & LINK BELT 24", 30", 36", 42", & 48" Widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—LINK BELT 48" x 154', 20 HP Motor.
4—LINK BELT 30" W x 45', 65' & 80'.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.

Roller

2500' MATHEWS 6", 12", 18" & 20" wide.
2 3/16" dia. roller, 11" hex shaft centers, 4" channel.
500—MATHEWS 12" & 36" wide, 3½" dia. 1" hex shaft on 6' centers, 6" channel.

Mold

1—LINK BELT 36 cars 4' x 5', 190' track, with automatic dump. New 1952.
3—LINK BELT 88 Cars 20" x 48", 350' track, with automatic dumping.

Belt

LINK BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

MOLDERS HOPPERS & STORAGE BINS

7—NATIONAL & LINK BELT Storage Bins, 60 to 150 tons cap.
42—MOLDERS Hoppers 1½ ton cap.
3—NEWAYGO HS-7-GT Twin Hopper Handy Sandy's.

SAND MULLERS

1—B & P #40 Speed Muller, 6 cu. ft.
1—B & P #50, SpeedMullers, 9 cu ft.
1—B & P #60, Speed Muller, 12 cu. ft.
2—B & P #70, Speed Mullers, 18 cu. ft.
1—CLEARFIELD #404, 4 cu. ft. batch.
2—CLEARFIELD No. 610 w/skip hoist loaders, 10 to 14 cu. ft. batch.
1—DRAVO-DOYLE 6 cu. ft. cap. Port.
1—LINK BELT 48" x 8' Paddle Type.
1—PEKAY No. 160-1-24 Mixer Muller, single stage for 24" belt, 230 TPH
1—SIMPSON #0, Style B, 175 lb.
1—SIMPSON #1½, Style UD, 700 lb., w/loader.
1—SIMPSON #2, Style C, 1500 lb., w/loader.
3—SIMPSON #3, Style C, 3000 lb., w/loader.
3—SIMPSON #3, Style UD, 3000 lb., w/loader.
1—SIMPSON No. 1H Style UD—500# batch.
2—Mixer Muller, 6 cu. ft. paddle type.

SAND PREPARATORS

2—NATIONAL #3 Style C Aerators.
6—ROYER Complete conditioning units including Shakeout, Belt Conveyor and Sand Blender.
6—B & P Screenerators, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—ROYER S-522-9M Scrap Control 60 ton per hour capacity.
1—AMERICAN "Sand Master," 102"/70" cutting blade—1952.
1—MOULDERS' FRIEND 60" Brush.
1—REDDY-SANDY Model RS-VM.

SANDSLINGERS

1—B & P Motive Jr., 300 cu. ft. tank.
2—B & P Tractor Type 19" head & 16" head, 13' arms. Magnetic towers.
6—B & P Models DB Stationary Sand Slingers, 16", 19" and 22" heads, with 20, 25, 40 and 50 HP motors. All late.
2—B & P Swing Type Slingers 19" head.
1—B & P 2 ton plate feeder.
4—B & P 8 ton plate feeders.
2—B & P 35 ton capacity plate feeders.

SHAKEOUTS & SCREENS

2—LINK BELT 5' x 10', 6 ton cap.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8', Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B, Single deck sifter screen, 10 HP motors.
1—HEWITT - ROBINS Vibra - Feeder 30" wide x 60" long.
2—ROBBINS 3' x 4' JF6—2000#
2—ROBBINS 3' x 5' JF6—2000#
1—ROBBINS 4' x 6' JF9—8000#
1—ROBBINS 4' x 8' JF9—10,000#
1—ROBBINS 6' x 10' JF11—20,000#
1—ROBBINS 8' x 10' JF11—30,000#
1—SIMPLICITY 4' x 6' Model B.

SAND BLAST EQUIPMENT

1—AMERICAN 36" x 42", w/skip Hoist.
2—AMERICAN 48" x 42", w/skip Hoist.
1—AMERICAN 27" x 36" w/skip hoist.
1—AMERICAN 48" x 48".
1—AMERICAN No. 1-B Suction Cabinet.
1—AMERICAN #3 Tablast, 4—48" tables.
1—AMERICAN #1 Tablast, 7-14" tables.
1—AMERICAN No. 2A multi-tablast.
1—AMERICAN 20" x 27" Rubber Belt Tumblast.
1—PANGBORN #45, type MT Sand Blast Room 10' L x 8' W x 6' H.
1—PANGBORN No. 53 type EN-2 blast cabinet with dust collector.
1—PANGBORN Model 6-LF, 6' diameter plain table with dust collector.
1—PANGBORN #44NF Shot Blast Room 10' x 9' x 9'.

TUMBLING BARRELS

13—SLY & WHITING. All late type units, with gearhead motors and built in magnetic brake, Timken bearings. Following sizes: 30" x 48", 24" x 48", 30" x 60", 36" x 84", 42" x 72", 48" x 72", 48" x 96", 72" x 120".

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THE ACME BARGAIN PAGE

AIR COMPRESSORS
2—INGERSOLL RAND 450 cfm., 100 hp., 220-440 V.
1—CHICAGO PNEUMATIC 225 cfm., 50 hp., 220-440 V.

BELTING
29" x 180' 24" x 152'
24" x 263' 24" x 120'

BLOWERS
GE 10500 cfm., 20 oz., 85 hp., 220 V.
GE 7500 cfm., 20 oz., 89.6 hp., 220-440 V.
GE Centrifugal 6200 cfm, 24 oz., 58 hp. motor
WHITING-ALLIS CHALMERS 5750 cfm., 28 oz., 60 hp., 440 V.
INGERSOLL-RAND 4000 cfm., 60 oz., 100/25 hp., 220-440 V.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
SPENCER 2850 cfm., 16 oz., 20 hp., 220-440 V.
SPENCER 270 cfm., 8 oz., 3 hp., 220-440 V.

CONVEYOR OVERHEAD CHAIN
1700' JERVIS B WEBB and LINK-BELT #678 with trolleys 36" centers. 2-5 hp. Variable speed caterpillar drives, & motor generator set, takeups and turns.

CONVEYOR
36" x 162' LINK BELT Oscillating Pan 10 hp., 220-440 V.
36" x 53' LINK BELT Oscillating pan.
17' BARBER GREEN Bucket Conveyor.
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.
18" x 10' Steel Apron Conveyor w/drives, 3 hp., 220-440 V.
16" x 120' Rubber Belt w/drives.

CORE BLOWERS
CHAMPION CB400 up to 300# cores, 6½" draw.
2—CB15 up to 55# cores, Universal blow plate
C.B. 10 up to 12# cores, 4½" draw.
DEMMLER #4 up to 250# cores.
DEMMLER #3 up to 35# cores.
DEMMLER #2 up to 20# cores.
INTERNATIONAL SB15H, up to 150# cores, Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
INTERNATIONAL SB 12, medium sized cores
INTERNATIONAL SB 11, medium sized cores
OSBORN 193 up to 50# cores
OSBORN 2035-2 large sized cores
REDFORD Bench types, horizontal or vertical clamping

CORE DRAW
SPO CD 36 14" x 41" rollout table.

CORE GRINDERS
7—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-303 42" table

CORE OVENS TOWER
COLEMAN Vertical-Horizontal 9000# per hour
COLEMAN Vertical-Horizontal 6800# per hour

CORE PASTE OVENS
COLEMAN 28' Horizontal

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw

CRANES
P&H 5 TON Electric Traveling DC motors 50' span
P&H 3 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 Ton AMERICAN Railmaster Low headroom floor control
10 Ton SHAW BOX electric hoist

CUPOLA GUNS
2—BONDACTOR #1250
BONDACTOR #1000

DUST COLLECTOR
PARSONS 40,000 cfm. cloth bag type

ELECTRIC MELTING FURNACES
SWINDELL 9' Dia. Top Charge cap. 3 ton steel 5 ton iron per hour, 3500 KVA 13800 volt transformer, complete in place
1—"LECTROMELT" 2 TON Size Q 4000# per hour 1500 KVA 13200 Volt
1—"LECTROMELT" Size S 1000# per hour, 500 KVA 7200 volt
1—"LECTROMELT" V 2-300# capacity per hour 220 volt primary
LECTROMELT 500#, Size T, 300-375 KVA 2300 V primary, Moore controls, G.E. circuit breaker.

ELECTRIC MELTING FURNACES
SINGLE PHASE
1—DETROIT ROCKING TYPE "LFY" 700# cold charge 7200 volts
1—DETROIT "LFC" 700# & 350# Tapered Shell 2300 V
2—DETROIT "LFC" 350# Tapered shell 7200V
1—DETROIT "LFA" 350# shell 13200 V
STROMAN 1000# Oil fired, hydraulic tilt.
CAMPBELL HAUSFELD Staty, pot type
FISHER RB100 gas fired crucible

FURNACE TRANSFORMERS
1—"LECTROMELT" 800 KVA, 12000 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 11200 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 13800 V., 3 phase

FURNACES NONFERROUS
1—HEVI-DUTY HD-181-S Pot type Electric
2—400# FISHER Gas Fired Tilting Furnaces
4—600# FISHER Gas Fired Tilting Furnaces
1—600# FISHER Gas Fired Stationary Furnace

GRINDERS, SNAG
FOX 24" x 2" Single Wheel 10 hp.
2—HAMMOND 20" DE 10WR1 10 hp., 220-440 V.
1—HAMMOND 20" DE Porter Cable backstands 10 hp.
1—HAMMOND 24" x 2" x 12" 7½ hp., 220 V.
HAMMOND WR-2, 2 speed, 30" x 3" wheel

GRINDERS, SWING FRAME
2—MARSCHKE 3 hp., 12" wheel
1—B&D 7½ h.p.
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
U.S. 20" x 2½" x 6" 10 hp., 220-440 V.

GRINDERS, MISC.
PORTER CABLE BG8 Wet-Dry Belt
U.S. #70 Combination 20" disc and 20" x 3" x 1½" wheel

HEAT TREATING FURNACES
HOLDEN #202 Electrode Type, Bright hardening annealing 1850°
DESPATCH DT36 Pit type 42" x 40" Electric

HOISTS
YALE 5 TON floor control power travel
SHAW BOX 5 TON floor control Hand travel
4—INGERSOLL-RAND Air trolleys
1—500# INGERSOLL RAND LC-4
4—CLEVELAND 2000# Cab type hot metal carriers

LADLES
1—6000# Industrial Enclosed Geared Crane
1—5000# Modern Enclosed Geared Crane
3—2125# Industrial Enclosed Geared Crane
1—2000# Whiting Enclosed Geared Crane

LADLE MIXING
4000# Industrial, Insulated

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES
JOLT SQUEEZE PIN LIFT
2—MILWAUKEE 125-3-21" x 27" Table 8" draw.
7—OSBORN 712 PJ, 18" x 21" Table
1—CHAMPION JSL10P 18" x 21" table 6" draw.

JOLT SQUEEZERS
2—INTERNATIONAL, LJS12 16" x 20" table
1—SPO, 110J Portable 17" x 20" table
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ

JOLT ROLLOVER DRAWS
2—1000# TABOR, 30" x 51" table, portable
1020 JOHNSTON & JENNINGS, 60" x 50" table
JOHNSTON & JENNINGS 918, 44" x 64" table, 20" draw, rollout table
2—750# HERMAN 20" x 30" table
20 x 8" INTERNATIONAL type G, 20" x 30" table
2—INTERNATIONAL RJ 20 x 12"

JOLT PIN LIFTS
3—INTERNATIONAL 1200-3 26" x 27" table 3" draw
1—INTERNATIONAL 30" x 8", type G.

PIN LIFT PUSHOFF
CHAMPION 28" x 42" table
MILWAUKEE 620ND 20" x 24" table

MULLERS and MIXERS
1—#2 SIMPSON Unit Drive
2—#1 SIMPSON Mullers

SAND CUTTERS
1—SCREENARATOR MODEL "S"
1—ROYER MCZ-43

SAND SLINGERS
2—B&P Tractor 19" heads
B&P 2 speed 40/25 HP double belt
B&P Plate Feeder, 5 ton

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic feed
30" TANNEWITZ, 3 hp., 440 V.
42" TANNEWITZ, 5 hp., 220-440 V.

SAWS, CUTOFF
DEWALT ME-1 16" Blade 5 hp.
DEWALT ME-3 Abrasive cutoff 18" wheel
DEWALT GP 14" wheel 3 hp. 220-440 V.
DELTA Abrasive cutoff

SCALE
FAIRBANKS PRINTOMATIC 6250#

SCREENS
3' x 8' SIMPLICITY

SHAKEOUTS
3' x 5' SIMPLICITY
5' x 6' SIMPLICITY
5' x 10' LINK BELT

SPRUE CUTTERS
2—PERKINS #53 1¼" stroke
1—MILWAUKEE #85 TON

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous type
COLEMAN 55 Spectrophotometer
BALDWIN SOUTHWARK 20,000 Tensile Tester w/load indicator and recorder

TUMBLING BARRELS
2—ROYERSFORD, 42" x 72", chain drive, late
WHITING 60" x 72" 20 hp. drive
SLY 42" x 42" x 64" 10 hp.

WHEELABRATORS
2—42" x 48" AMERICAN Skip Loader
1—27" x 36" AMERICAN Skip Loader
1—20" x 27" AMERICAN Rubber Belt

WOODWORKING—PATTERNSHOP
GARDNER 30" DISC and Spindle Sander
JONES SUPERIOR 48" Double Disc.
OLIVER 72DR Router or borer
PORTER 24" Facing Planer
BOICE CRANE 12" Planer
HESTON ANDERSON Swing Saw #5
DELTA 10" UNISAW
NORTHFIELD #4 Tilting Arbor Saw

WIRE STRAIGHTENERS
AMERICAN type H rod ⅜"-⅝" cap.
2—#2A CLIMAX ¼"

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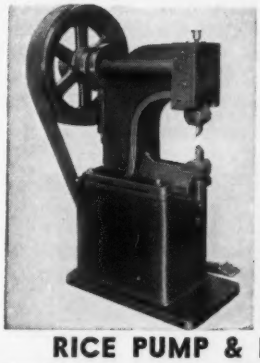

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Sprue Cutter
for
Non-Ferrous Foundries

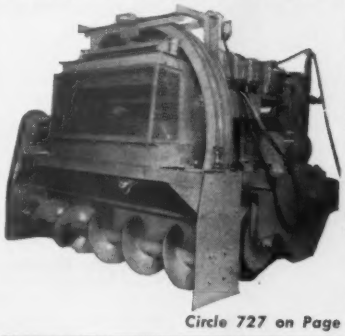
- Cuts Sprues and Gates with One, Swift, Sure Stroke.
- Does away with tedious hand labor.
- Speeds flow of work through cleaning department.
- Built for years of Rugged, Low-Cost Service.
- 2 Sizes, ¾" and 1¼" square. Built-in electric motor or belt drive.

Write for Illustrated Bulletin

RICE PUMP & MACHINE CO.
222 Park Ave. Belgium, Wis.

Circle 725 on Page 51

BETTER MAGNETIC SEPARATION and Far Lower Maintenance Cost with RINGLIFT CONDITIONER



Reduces need for mulling. Mixes, adds water, lifts all sand from floor, screens, magnetically separates, aerates. Cools hot sand. Cuts swath to 104", turns in 63" radius. Straddles 24" high x 70" windrows. Most economical machine of its type to buy, operate and maintain. Send for folder.

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Circle 727 on Page 51

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1 4-PASS COUNTER FLOW!
2 MASTER CONTROL PANEL!
3 STAINLESS STEEL COMBUSTION CHAMBER!
4 DOUBLE CASING WITH METAL RADIATION SHIELD!

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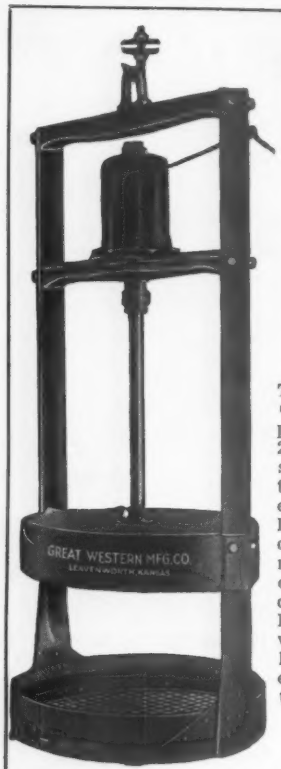
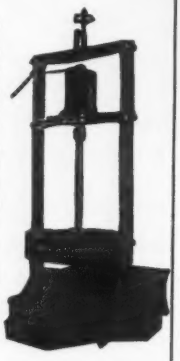
Circle 728 on Page 51



DOES THE WORK OF 20 MEN

COMBS
Gyratory
RIDDLES



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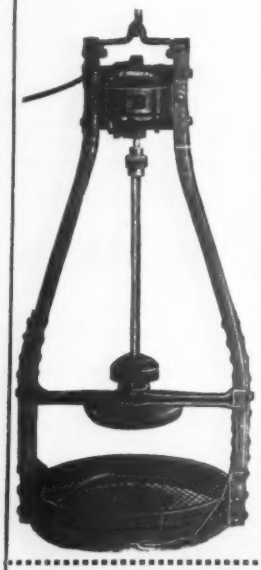

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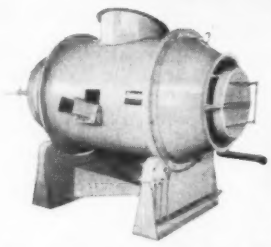

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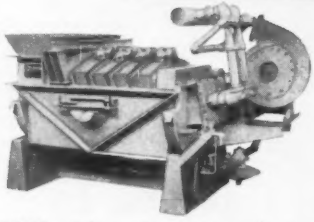

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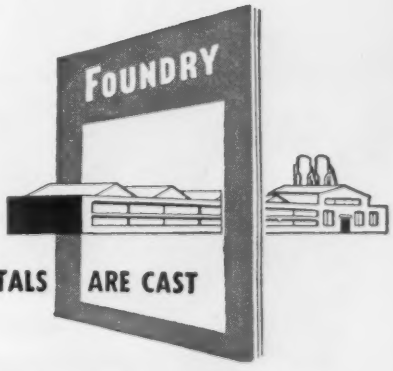

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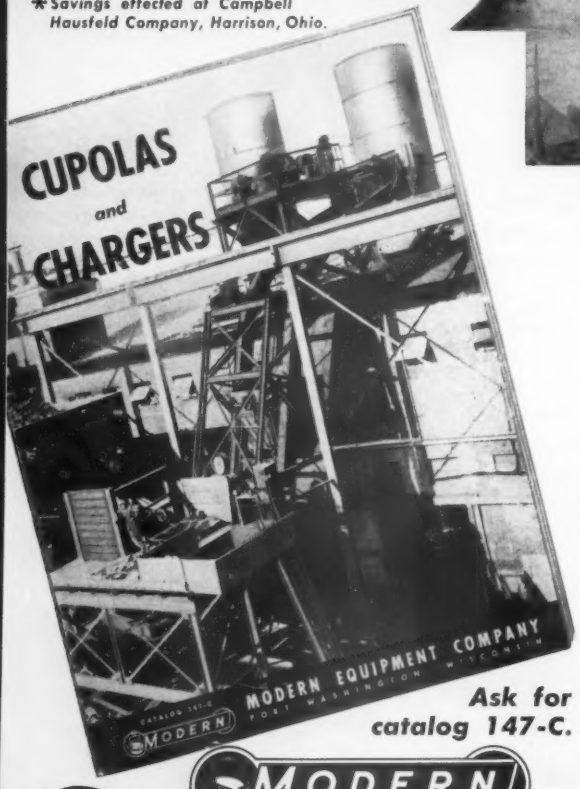

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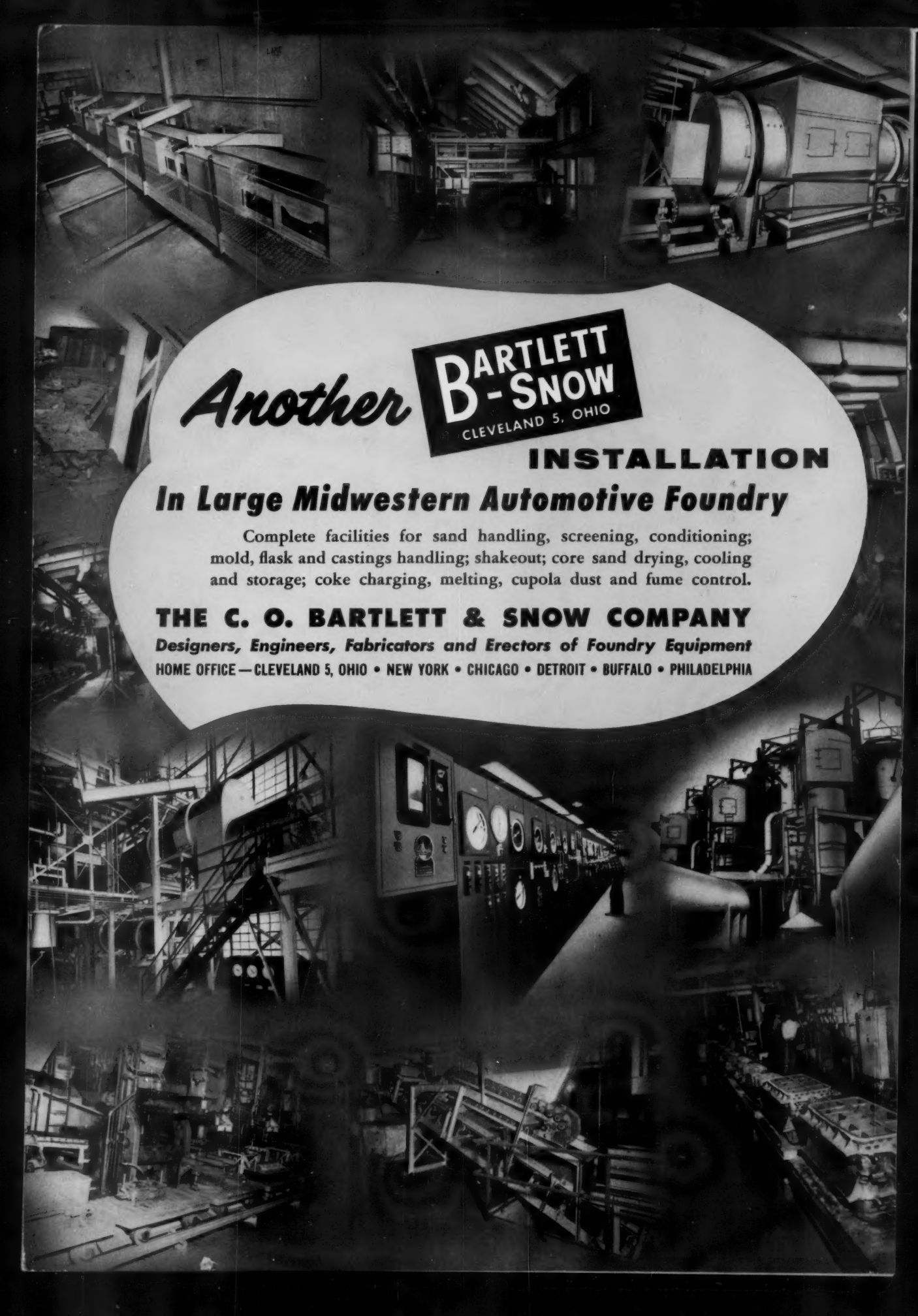
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